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Abstracts

45. Jahrestagung der Österreichischen Gesellschaft für Pneumologie 5. Jahrestagung der Österreichischen Gesellschaft für Thoraxchirurgie

06.–08. Oktober 2021

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FÄLLE DES JAHRES 2021 CASES OF THE YEAR 2021

F01

28-jährige Patientin mit beidseitiger abszedierender Pneumonie

Tjasa Kamenski, Markus Rauter

Abteilung für Lungenkrankheiten, Klinikum Klagenfurt

Patienten Charakteristik, Anamnese und Symptome: Es handelt sich um eine 28-jährige Patientin mit protrahierten fieberhaften broncho-pulmonalen Infekt mit neu aufgetretenen Hämoptysen. Fieberzacken bis 41 °C, Nikotinabusus, in der weiteren Folge präsentiert sich die Patientin mit akuter Sinusitis mit weiterhin persistierenden Fieberschüben trotz antibiotischer Therapie, sowie neu aufgetretene Hämaturie.

Diagnostik: Anamnese und Status, Labor (inkl. ANA, ANCA, Galaktomannan), Quantiferon, Harn Sediment, Sputum Abnahme, CT Thorax, Herz Ultraschall, Bronchoskopie in LA, Lobektomie Mittellappen rechts und Unterlappen links, Nasenschleimhautbiopsie

Diagnose: PR3 ANCA assoziierte Vaskulitis

Differentialdiagnose: Abszedierende Pneumonie/Aspergillom beidseits/Vaskulitis andere Genese

Therapie: Z. n. mehrfach antibiotischer Therapie mit Clavamox, Avelox/Dalacin, Meropenem/Dalacin/Metronidazol/Cefotaxim, dann Hochdosis-Cortison Therapie und letztendlich Induktionstherapie mit Rituximab nach dem RAVE-Schema

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Abb. 1 | F01 CT Thorax bei der Aufnahme

The authors marked with an asterisk (*) are the corresponding authors.

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F02

Zufallsbefund ‚Riesentumor‘

Florian Ponholzer¹, Giovanni Bocchialini¹, Rosemarie Bauer, Peter Errhalt², Elisabeth Stubenberger³, Thomas Schweiger¹, Konrad Hoetzenecker¹

¹Universitätsklinik für Thoraxchirurgie, Medizinische Universität Wien, Österreich

²Klinische Abteilung für Pneumologie, Universitätsklinikum Krems, Karl Landsteiner Universität für Gesundheitswissenschaften, Krems, Österreich

³Klinische Abteilung für Allgemein- und Thoraxchirurgie, Universitätsklinikum Krems, Karl Landsteiner Universität für Gesundheitswissenschaften, Krems, Österreich

Patienten Charakteristik, Anamnese und Symptome: Mann, 36-jährig, Nieraucher, keine Vorerkrankungen, unauffällige Familien- und Berufsanamnese. Erstvorstellung bei der niedergelassenen Pulmologin aufgrund von seit zwei Monaten bestehender Belastungsdyspnoe sowie thorakalem Druckgefühl.

Diagnostik und Diagnose: Primär Verdacht einer kardialen Genese, EKG/Laboruntersuchungen ergeben allerdings keinen Hinweis darauf. Die weitere pulmologische Abklärung zeigt eine milde restriktive Ventilationsstörung (VCmax 77 %; TLC 79 %), die jedoch die starken Symptome des Patienten nicht erklärt. Deshalb Veranlassung eines Thorax-Röntgens, welches überraschend eine große Raumforderung im linken Hemithorax zeigt. Die unmittelbar danach folgende CT bestätigt einen 18 × 15 cm glatt begrenzten Tumor mit intraläsionalen Verkalkungen. Er geht von der vorderen Thoraxwand aus und komprimiert größenbedingt beide Ventrikel.

Therapie: Aufgrund der bereits hämodynamisch wirksamen Kompression des Herzens wird der Patient sofort an die Universitätsklinik für Thoraxchirurgie Wien überstellt wo die Indikation zur primären Resektion gestellt wird. Unter Herz-Lungen-

Abb. 1 | F02 a) Präoperative Computertomographie in der Koronalebene. b) Intraoperativer Befund nach Durchführen der Clamshell-Inzision und teilweiser Freipräparation des ventralen Tumorbereiches. c) Letzte Gewebebrücke vor Bergung des Tumors. d) en-bloc Tumorsektat mit Rippen- und partieller Sternumresektion. e) Thoraxwandrekonstruktion mittels GoreTex-Patch

Maschinen-Standby erfolgt eine en-bloc-Tumorresektion mit Rippenteilresektionen V-VII und partieller Sternumresektion. Die histologische Aufarbeitung ergibt ein, im Gesunden reseziertes, vom Sternum ausgehendes low-grade Chondrosarkom.

Konklusion: Trotz aller bekannten Einschränkungen ist ein Thoraxröntgen eine gute Übersichtsuntersuchung und die Indikation dazu soll liberal erfolgen. Niedergelassenen Pulmologen kommt oft eine entscheidende Rolle in der Erstdiagnostik von thorakalen Tumoren zu.

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F03

Mehrjähriger eosinophiler rezidivierender Pleuraerguss

Sven Heldt, Matthias Neuböck, Guangyu Shao, Bernd Lamprecht, Helmut JF Salzer

Kepler Universitätsklinikum Linz, Klinik für Lungenheilkunde

Patienten-Charakteristik, Anamnese, Symptome: Der 47-jährige männliche Patient litt seit 3 Jahren an einem langsam rezidivierenden Pleuraerguss rechts, war aktiver Raucher, hatte einen Hund und plante beruflich Biomüll-Weiterverwertungsanlagen. Vorerkrankungen und Dauermedikation lagen keine vor. Es sollte eine Pleuratuberkulose überprüft werden, da seine Schwester eine aktive Lungentuberkulose hatte. Der Erguss wurde initial zweimalig extern untersucht, war dort eosinophil, initial begleitet von einer absoluten Blut-Eosinophilie (später nicht mehr nachweisbar), die Autoimmun-Diagnostik war damals unauffällig, maligne Zellen fanden sich nicht, jedoch zwischenzeitlich ein geringer Perikarderguss. Eine Ursache konnte nicht identifiziert werden. Der Patient war bei uns klinisch asymptomatisch.

Diagnostik und Diagnose: Laborchemisch waren die D-Dimere erhöht und Entzündungsparameter und Differential-Blutbild unauffällig. Eine Angio-Thorax-Computertomographie konnte keine Pulmonalarterienembolie nachweisen, jedoch einen geringen Pleuraerguss rechts, apikale Schwielen beidseits und subpleurale rundherdartige Verdichtungen im Mittellappen. Eine Bronchoskopie ergab eine Neutrophilie in der bronchoalveolären Lavage, Ziehl-Neelsen-Färbung und Mycobakterium-tuberculosis-Complex-PCR blieben negativ, maligne Zellen waren nicht nachweisbar und pathogene Erreger fanden sich nicht. Die Oberbauchsonographie, Allergiediagnostik und die autoimmunologische Diagnostik blieben unauffällig. Wurmeier im Stuhl waren negativ. Es ließen sich nur wenige Milliliter Pleuraerguss gewinnen, sodass nach Literaturrecherche die Diagnostik auf eine PCR auf *Strongyloides stercoralis* beschränkt werden musste, welche aber positiv war. Die Serologie auf Toxocariasis, Zystizerkose und Echinokokkose war negativ, auf Ascariasis und insbesondere *Strongyloides* positiv. Demnach handelte es sich um eine pleurale *Strongyloides-stercoralis*-Infektion.

Therapie: Einmalig Ivermectin 200 µg/kg Körpergewicht p.o. In der Nachkontrolle über 4 Monate war der Erguss regredient.

Literatur

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F04

Anti-IL-5 Therapie bei eosinophiler Pneumonie

Katharina Moritz, Antonia Roithinger, Georg Christian Funk

2. Medizinische Abteilung mit Pneumologie, Klinik Ottakring, Wien

Patienten-Charakteristik, Anamnese, Symptome: Eine 50-jährige Raucherin ohne Vorerkrankungen klagt seit wenigen Wochen über Husten, Belastungsdyspnoe und Nachtschweiß. Im Lungenröntgen zeigt sich eine Verschattung im linken Oberlappen, im CT-Thorax zeigen sich in beiden Oberlappen symmetrische, peripher betonte Konsolidierungen. Als wegweisender Befund kann eine periphere Eosinophilie von 1,68G/L (25 % relativ) erhoben werden. In der transbronchialen Lungenbiopsie zeigt sich eine eosinophile Pneumonie, untermauert durch eine hocheosinophile BAL. Lungenfunktion und Gasaustausch sind normal. Hinweise auf eine eosinophile Entzündung liefern zudem das deutlich erhöhte ECP und FENO.

Diagnose: In Zusammenschau stellen wir die Diagnose einer chronisch eosinophilen Pneumonie und leiten nach Abwägen aller Vor- und Nachteile (insbesondere der 50 % Relaps-Wahrscheinlichkeit nach 6–12 monatiger Hochdosis-kortisontherapie) und umfassender Literaturrecherche eine off-label.

Therapie: Therapie mit dem Anti-IL-5 Antikörper Mepolizumab (Nucala®) ein. Erfreulicherweise zeigt sich bereits nach zwei Wochen ein fulminantes Ansprechen: Die Patientin wurde beschwerdefrei und die Konsolidierungen waren im Lungenröntgen nahezu vollständig zurück gebildet. Es traten keine Nebenwirkungen auf. Als zusätzliche Verlaufsparemeter kann die Halbierung des FENO sowie eine Normalisierung der peripheren Eosinophilie herangezogen werden. Zusammenfassend konnten wir mit diesem Fall einer eosinophilen Pneumonie – abseits des schweren eosinophilen Asthmas – den raschen Therapieerfolg der Anti-IL-5 Antikörper sowie ein ausgezeichnetes Nebenwirkungs- und Sicherheitsprofil dokumentieren.

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F05

UFOs in der Lunge

Ullmann S¹, Jaksch P², Hoetzenecker K², Geleff S³,
Prosch H⁴, Doberer D¹, Valipour A¹

¹ Abteilung für Innere Medizin und Pneumologie, Klink Floridsdorf, Wien (presenting)

² Universitätsklinik für Thoraxchirurgie, Medizinische Universität Wien, Wien

³ Klinisches Institut für Pathologie, Medizinische Universität Wien, Wien

⁴ Klinische Abteilung für Allgemeine Radiologie und Kinderradiologie, Medizinische Universität Wien, Wien

Patienten Charakteristik, Anamnese und Symptome: Eine 25-jährige Patientin wird bei hypoxischer Insuffizienz und bilateralen Infiltraten stationär aufgenommen. Sie ist kachektisch (BMI 15.2), klagt über ausgeprägte Kurzatmigkeit sowie Husten. Im klinischen Status finden sich basale Rasselgeräusche beidseits.

An Vorerkrankung ist auf ein allergisches Asthma mit hoch positivem Prick-Test (Milbe, Altanaria, Katze) seit dem 6. Lebensjahr zu verweisen. Bei leichtgradiger, reversibler Obstruktion und entsprechender Symptomatik wurde eine ICS/LABA-Therapie initiiert.

Diagnostik und Diagnose: Bei Aufnahme präsentierte sich die Patientin mit einer ausgeprägten respiratorischen Partialinsuffizienz (BGA mit 5 L/min O₂: 58 mmHg pO₂, 32 mmHg pCO₂, pH 7.41). In einer CT-Thorax zeigen sich beidseits neue, konfluierende Unterlappen-betonte Milchglasverdichtungen, laborchemisch eine Blut-Eosinophile bis 1000/μL, Lungenfunktionell eine höhergradige restriktive Ventilationsstörung und schwergradige Diffusionsstörung. Die primäre, klinisch-radiologische Verdachtsdiagnose ist eine ANCA-neg. pulmonale Eosinophile Granulomatose mit Polyangitis (EGPA). Differentialdiagnostisch wird ein schweres hypereosinophiles Asthma mit fungaler Sensibilisierung in Betracht gezogen. Eine hämatologische Genese wurde bei unauffälliger Knochenmarksbiopsie und Zytogenetik ausgeschlossen.

Therapie: Unter hochdosierter systemischer Kortisontherapie und Anti-IL5-Therapie, sowie Plasmapherese und Rituximab, kann trotz nasaler high-flow O₂-Therapie und nicht-invasiver Beatmung keine respiratorische Stabilisierung erzielt werden. Letztlich wird die Indikation für eine high-urgent

Doppellungentransplantation gestellt. Zwei Monate nach der Transplantation ist die Patientin wieder ohne O₂-Bedarf.

Diskussion: Die Pathologie der explantierten Lunge zeigt das Bild einer ausgeprägten Lipoidpneumonie („unidentified fatty objects“ - UFOs) vom alveolären und interstitiellen Typ.

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F06

Kleiner Herd mit großer Wirkung?

Marlene Auer, Waltraud Riegler, Peter Errhalt

Klinische Abteilung für Pneumologie, Universitätsklinikum Krems

Anamnese: Die stationäre Aufnahme der 63-jährigen Patientin erfolgt initial aufgrund von Gewichtsverlust sowie einer unklaren neuromuskulären Erkrankung mit Horner-Trias links und zunehmender Schluckstörung. Bei Verdacht auf Miller-Fisher-Syndrom DD paraneoplastisches Syndrom werden sämtliche Untersuchungen und therapeutische Versuche an der Neurologie in St. Pölten durchgeführt (u. a. Kortison-Stoß-Therapie, 6× Plasma-Exchange), bleiben aber ohne Erfolg. Die neuromuskuläre Symptomatik verschlechtert sich innerhalb von zwei Wochen dramatisch, sodass die Patientin bei respiratorischer Insuffizienz intubiert und beatmet werden muss.

Diagnostik: In einem CT Thorax finden sich ein ca. 1 cm kleines fragliches Primum im rechten Oberlappen pleuraständig, keine vergrößerten Lymphknoten in Position N1 oder N2, allerdings ein deutlich vergrößerter Lymphknoten in Position N3 (kontralaterales Mediastinum). Mittels EUS wird dieser paratracheale Lymphknoten punktiert, histologisch zeigt sich ein kleinzelliges neuroendokrines Karzinom. Als wahrscheinlichste Diagnose stellt sich nun ein paraneoplastisches Lambert-Eaton-Syndrom dar.

Da es jedoch sehr ungewöhnlich erscheint, dass so ein kleines Lungenprimum ohne regionale Lymphknoten, aber bereits mit N3-Lymphknoten eine solch ausgeprägte neurologische Symptomatik verursacht, wird an der intubierten und beatmeten Patientin noch ein PET-CT durchgeführt. Hier zeigen sich tatsächlich nur der bereits bekannte 1 cm kleine Herd im rechten Oberlappen und zwei Lymphknoten im kontralateralen Mediastinum hypermetabol, sodass wir von einem kleinzelligen Bronchialkarzinom mit einem assoziierten Lambert-Eaton-Syndrom ausgehen müssen.

Therapie: Als einzig potentiell wirksame Therapiemaßnahme entscheiden wir uns zur Einleitung einer Chemotherapie mit Cisplatin/Etoposid. Dies erfolgt nach Aufklärung der Familie und unter Berücksichtigung des mutmaßlichen Patientenwillens (Pat. immer noch intubiert und beatmet!).

Verlauf: Nach 2 Zyklen Chemotherapie ist die neuromuskuläre Symptomatik soweit zurückgebildet, dass die Patientin extubiert und in weiterer Folge auf der Normalstation remobilisiert werden kann. Aktuell ist eine konkomitante Radiotherapie zum 4. Zyklus geplant.

Abb. 1 | F05

Literatur

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F07

Unklare Infiltrate aus Mexiko

Markus Zwilak, Gerald Steiner, Eveline Kink

Abteilung für Innere Medizin und Pneumologie, LKH Graz II, Standort Enzenbach

Anamnese: Ein 57-jähriger, in Mexiko lebender, Patient kommt zur Abklärung unklarer pulmonaler Rundherde. Es besteht eine ungewollte Gewichtsabnahme, ein gelegentlicher Husten ohne Auswurf und ein Nikotinabusus mit 30py. Die Zuweisung erfolgt zum Ausschluss einer TBC bei positivem Quantiferontest.

Diagnostik: Im Thoraxröntgen zeigen sich in Projektion auf das rechte Oberfeld flächige Infiltrate. In der CT- Thorax kommen zwei bis 1,5 cm große Rundherde im Oberlappen rechts mit zentraler Kaverne, sowie eine subpleural gelegene Läsion im posterobasalen Unterlappen links zur Darstellung. Diese imponiert thoraxsonographisch als echoarme Struktur ohne Gefäßdarstellung. Zusätzlich besteht eine hiläre Lymphadenopathie. Zur weiteren Abklärung bzw. zum Ausschluss einer Mykobakteriose erfolgt eine komplikationslose FBSK, es zeigt sich ein unauffälliges Tracheobronchialsystem. Die histo- und zytopathologischen Befunde sind bis auf eine mittelgradige chronische Entzündung unauffällig. Eine TBC kann im Rahmen des stationären Aufenthaltes mittels PCR und nachfolgend mittels Kultur ausgeschlossen werden. Kulturell zeigt sich jedoch das Wachstum von *Pasteurella multocida* aus dem Lavat, sodass in Zusammenschau der Befunde von einer Pasteurellose ausgegangen wird.

Diagnose: Der Erreger der Pasteurellose ist *Pasteurella multocida*, benannt nach Louis Pasteur. Es ist ein gramm-negatives Bakterium, in der oralen Flora von Hunden und Katzen vorkommend. Die Übertragung auf den Menschen erfolgt durch Biss- und/oder Kratzwunden. In der Literatur wird jedoch auch eine Übertragung durch Liebkosen der Haustiere beschrieben¹. Pulmonal manifestiert sich die Infektion als Pneumonie, Empyem oder Abszess. Die Diagnose stellt sich klinisch durch anamnestisch angegebenen engen Tierkontakt bzw. Biss- und Kratzwunden und durch kulturelle Anzucht².

Therapie: Unsererseits erfolgt eine Antibiose laut Antibogramm mittels Amoxicillin/Clavulansäure. Penicilline sind Mittel der Wahl, alternativ kommen jedoch auch Fluorchinolone oder Cephalosporine in Frage. Bei der ambulanten Kontrolle

zeigt sich der Patient kardiorespiratorisch beschwerdefrei und die Infiltrate im Thoraxröntgen regredient.

Literatur

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F08

Pneumomediastinum, Pneumoperikard und Pneumothorax bei einem Patienten mit schwerer COVID-19 Pneumonie unter NIV-Therapie

Ivan Fedak, Marco Idzko, Daniela Gompelmann, Lukasz Antoniewicz, Slagjana Stoshikj

Medizinische Universität Wien, Universitätsklinik für Innere Medizin II Klinische Abteilung für Pulmologie, Wien, Österreich

Patienten Charakteristik, Anamnese und Symptome: 59-jähriger Mann, ex-Raucher (ca. 50 PY), BMI 27.2 kg/m², Arterielle Hypertonie vorbekannt.

Notfallaufnahme bei zunehmender Ruhedyspnoe, Schüttelfrost, leichter Schwindel und Übelkeit. SARS-CoV-2 positiv seit 6 Tagen, Infektionsquelle – a. e. Familienkreis.

Art.BGA mit 6L O₂-Insufflation: pO₂ 49 mmHg.

C/P: bipulmonale Strukturverdichtungen, kein Pneumothorax.

Labor: WBC 6.93 G/L, CRP 14.12 mg/dL, IL-6 54.30 mg/dL, D-Dimer 1.01 µg/mL, leicht erhöhte Leberwerte.

Diagnostik und Therapie: Aufgrund fehlender respiratorischer Besserung unter CPAP-Therapie (10 cmH₂O+10 L O₂) mit mobilem Gerät, wurde der Patient auf IMC-Position transferiert. Weitere NIV-Therapie (Servo I, PEEP 10 cmH₂O, DU 4 cmH₂O, FiO₂ 60%) führte zu einer Stabilisierung der aBGA-Werte (pO₂ 73 mmHg).

Weiterhin wurde die Steroidgabe, prophylaktische Antikoagulation sowie NIV intermittierend mit High-FlowO₂-Therapie unter engmaschigen Blutgaskontrollen geführt.

Nach 6 Tagen verzeichnete sich einen Anstieg des D-Dimers bis 16.57 µg/mL. Spiral-CT: Pulmonalembolie im LUL, ein Bild eines Pneumoperikards und Pneumomediastinum.

Die Antikoagulationstherapie wurde voll dosiert, NIV-Beatmung bei schlechter respiratorischer Situation weitergeführt.

Abb. 1 | F08

Nach 11 Tagen zeigte sich in der Kontroll-CT ein deutlich progredientes Pneumoperikard und Pneumomediastinum sowie neu abgrenzbarer Pneuspalt, jedoch eine Regredienz der Entzündungsareale (s. Bilder).

Bei Besserung der Werte wurde weitere respiratorische Unterstützung nur mit dem HighFlowO2 adaptiert und schrittweise reduziert. CT Nach 3 Tagen: deutliche Rückbildung der Pneumatosen. Der Patient wurde folglich auf die post-COVID-Station ohne Sauerstoffbedarf transferiert.

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F09

Idiopathischer Enterothorax bei transdiaphragmaler-interkostaler Hernie nach Hustenattacke

Kratzer T., Huber J., Krause A., Roth N., Függer R.

Abteilung für Thoraxchirurgie, Ordensklinikum Linz

Anamnese: Ein 78 jähriger Patient wird mit plötzlich einsetzenden linksthorakalen Schmerzen in der Notaufnahme vorstellig. Anamnestisch lässt sich eine heftige Hustenattacke eine Woche zuvor eruieren, welche eine Schwellung linksthorakal sich zog. An Komorbiditäten sind eine Adipositas Grad I, Epilepsie sowie COPD bekannt.

Klinik: Adipöser Patient (BMI=30,86), thorakobasal links abgeschwächten Atemgeräuschen, reponible Herniation linksthorakal.

Diagnostik: CT: Riesige Zwerchfellhernie links mit einer Bruchlücke von 8,5 cm, Verlagerung Kolon transversum und descendens nach intrathorakal, Verlagerung von Kolonanteilen nach subkutan durch den 8. Interkostalraum.

Laborchemie: Leukozyten 14,1 G/l, CRP 15,27 mg/dl, Prothrombinzeit 74 %, PTT 36 sec.

Therapie: In der notfallmäßigen Laparoskopie stellt sich die Zwerchfellhernie ventral der Milz dar, durch welche das gesamte Omentum majus, Teile des Colon transversum und – descendens ziehen. Nach Reposition präsentiert sich das Colon vital. Intrathorakal zeigt sich der Einriss der 8./9. Interkostalmuskulatur und konsekutiver Diastase der Rippen von ca. 10 cm. Anschließend posterolaterale Thorakotomie im Bereich der Interkostalmuskelläsion am 8. ICR mit direktem Bruchlückenverschluss der Zwerchfellhernie sowie Rippencerclage.

Diskussion: Zusammenfassend zeigt dieser seltene Fall, der in vergleichbarer Form bisher nur 18 Mal beschrieben wurde, ein bisher noch völlig unbekanntes Spektrum an atraumati-

schen Hernien auf, deren Genese noch nicht vollständig geklärt ist.

Literatur

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F10

Ein 31-jähriger Mann mit Muskelschmerzen, Schwäche und Gewichtsverlust

E. Uzunkaya, W. Pohl

Abteilung für Pulmologie, Klinik Hietzing, Wien

Symptome und Anamnese: Immobilität, Rollator, Sarkopenie (>15 kg Gewichtsverlust in 2 Monaten), Allodynie – linker Fuß (Peroneus) – Schlurfgang, Dysästhesie (Ulnaris) rechts.

SozialAnamnese: Kickboxen, LKW-Fahrer, Bauarbeiter, AMS

Atopische Diathese/Dermatitis, Polyallergie, Polyposis nasi, Pansinusitis, FESS, Post Nasal Drip, Asthma, Eosinophilie, Anaphylaxis + Sweet Syndrome St.p. Benralizumab, FUO.

Diagnostik: C/P: geringe Emphysemzeichen.

CTT: Lingula-Konsolidierung, mediastino-hiläre Lymphadenopathie

Neuromuskuläre Sonografie: SNUS.

MRT: C5/C6 – Protrusion + Neuroforaminstenose (Radix ventralis) beidseits.

Labor: Rheumafaktor 359–498 U/mL, Gesamt-IgE 3120 U/mL, IgE sxl Ag-Mix 17,8 kU/L, IgG 2040 mg/dL, Eosinophilie 1,41–8,21 G/L, Tumormarker unauffällig, BSG 98 mm, Autoimmundiagnostik/c-/p-ANCA negativ, Eisenstatus unauffällig, onkoneuronale AK negativ.

Elektrophorese: Albumin 37,7 %, α -1 10,2 %, α -2 11,9 %, β -2 7,5 %, γ 27,1 %.

Sputum-Zytologie: entzündlich, eosinophil.

Quantiferon Test: negativ.

Lungenfunktionsdiagnostik (unter Therapie): leichte Bronchoobstruktion, keine Restriktion, keine signifikante Reversibilität nach Broncholyse, RV erhöht – pulmonale Überblähung.

NLG: symmetrische primär axonale sensomotorische PNP und N. Ulnaris Neuropathie rechts.

Dermatologie: Atopische Dermatitis, Stanzbiopsie: unauffällig.

Diagnose: Eosinophiles Granulomatöse Polyangiitis („Churg-Strauss-Syndrom“) – 5/6 ACR

Mononeuritis multiplex/EGPA-assoziierte axonale sensomotorische PNP

Sulcus Nervus Ulnaris Syndrome

DifferentialDiagnose: Neuropathia – Lymphominfiltration, Diskusherniation

Therapie: Tapering Apremnislon 75 mg bis 5 mg 1 × 1, Physiotherapie

Literatur

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tric study. Eur J Neurol. 2010;17(4):582–8. <https://doi.org/10.1111/j.1468-1331.2009.02902.x>.

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F11

Respiratorische Globalinsuffizienz bei einer 46-jährigen Nie-Raucherin

Katarina Zeder, Vasile Foris, Gabor Kovacs, Horst Olschewski

Klinische Abteilung für Pulmologie, Interne Medizin, Medizinische Universität Graz, Graz, Austria

Patienten Charakteristik, Anamnese und Symptome: Im Mai 2021 Vorstellung einer 46-jährigen Patientin in der Notaufnahme aufgrund von Dyspnoe und Beinödemen seit 4 Tagen. Dauermedikation mit Lixiana und Nebivolol aufgrund von paroxysmalem Vorhofflimmern seit 2019. ICS/LABA Inhalation wegen chronischer Bronchitis seit Kindheit. Aufgrund von abdominalen Schmerzen wurde Lixiana 14 Tage vor Aufnahme pausiert. Kurz nach der Geburt operative Korrektur einer Ösophagusatresie IIIb und Rekonstruktion mittels Koloninterponat mit Nachoperationen wegen tracheoösophagealer Fistel. Langfristiger zentraler Venenkatheter über linke V. femoralis. 2005 akut auf chronische Beckenvenenthrombose links, danach Varikosis Operation links. Thrombophilie-Screening negativ, daher keine Antikoagulation.

Diagnostik: Bei Aufnahme Blutdruck 140/90 mmHg, Puls 80/min, Temp 36,8 °C. Im EKG Sinusrhythmus mit Rechtstyp. Sauerstoffsättigung unter Raumluft 78 %. Arterielle Blutgase mit pO₂ 47 mmHg, pCO₂ 60 mmHg, pH 7,42. Covid-PCR negativ. Labor bis auf D-Dimer 0,76 mg/L und NT-pro BNP 6864 pg/ml unauffällig. Im PAE-CT Ausschluss einer akuten PAE, jedoch Dilatation des rechten Ventrikels und Truncus pulmonalis sowie aller zentraler Pulmonalarterien. Mosaikperfusion bipulmonal mit Flüssigkeitseinlagerungen in den Interlobulärsepten beidseits. Verdacht auf Pneumothorax im Bereich des linken oberen Mediastinums.

Echokardiographie mit Trikuspidalinsuffizienz von 3,8 m/s (geschätzter sPAP 58 + 10 mmHg). Vena cava inferior gestaut ohne Atemmodulation. Im Rechtsherzkatheter schwere präkapilläre pulmonale Hypertonie (PAP 93/41/58 mmHg, PVR 13 wood units).

Lungenfunktion mit schwerer kombinierter Ventilationsstörung mit überwiegender Restriktion.

V/Q Szintigraphie mit unauffälliger Ventilation, jedoch nur minimaler Perfusion der linken Lunge.

In der Spiroergometrie peakVO₂ 28 % mit Zeichen der schweren Gasaustauschstörung und Perfusionsinhomogenität in Ruhe und bei Belastung.

Diagnose: Schwere Chronisch thromboembolische pulmonale Hypertonie (CTEPH) und respiratorisches Versagen über kardiale Dekompensation bei vorbestehender Ventilationsstörung.

Differentialdiagnostik: Covid-19 Pneumonie, Kardiale Dekompensation, COPD Exazerbation, Akute Pulmonalarterienembolie, Pneumothorax, Myokardinfarkt, Asthma Exazerbation, Obesity Hypoventilationssyndrom

Therapie: Nach 9 Tagen NIV und Antikoagulation Rekompensation. Einleitung von Riociguat. Evaluation hinsichtlich Pulmonalisendarterektomie oder Ballonangioplastie.

Literatur

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F12

Geküsst und trotzdem bissig

Daniel Miner

Universitätsklinik für Pneumologie, PMU Salzburg

Patienten Charakteristik, Anamnese und Symptome: Wir berichten von einem 79-jährigen Patienten, welcher sich notfallmäßig vorstellte und über allg. Müdigkeit klagte. Die initiale ambulante Abklärung zeigte u. a. eine rechtsseitige supraklavikuläre Lymphadenopathie sowie zwei kleine abklärungsbedürftige pulm. Rundherde auf. Sein Zustand verschlechterte sich jedoch rasch, sodass er drei Tage später, O₂-pflichtig und mit deutlich erhöhten Entzündungswerten, stationär aufgenommen werden musste. Im PET-CT zeigte sich die inzwischen zentral nekrotisierende Raumforderung als rasch wachsend und als intensiv mehrspeichernd. Die Blutkulturen ergaben im weiteren Verlauf den Nachweis von *Francisella tularensis*.

Diagnostik: Wir diagnostizierten somit einen seltenen Fall von pulmonaler Tularämie. Der Patient gab an, zwei Eseln zu pflegen ohne weitere Tierkontakt. Später gab er jedoch an, dass sich mehrere Hasen in der Nähe seiner Esel aufhielten. Die Esel haben ihn während der Fütterungen auch regelmäßig an der rechten Hand gebissen. Die Infektion wurde somit als sekundär pulmonal bei hämatogener Streuung gewertet.

Obwohl an Tularämie erkrankte Esel als eine der ersten bekannten biologischen Waffen bereits in der Antike genutzt wurden, sind sie heutzutage nur noch selten als Vektoren dieser humanpathogenen Zoonose bekannt.

Therapie: Wir leiteten eine Antibiose mittels Ciprofloxacin ein. Der Zustand des Patienten besserte sich hierunter rasch.

Abb. 1 | F12

Literatur

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F13

Au – was knackt denn da am Schlüsselbein?

Ricarda Gruber, Michael Lechner, Jörg Hutter

Universitätsklinik für Chirurgie, Uniklinikum Salzburg der Paracelsus Medizinischen Privatuniversität, Salzburg

Patienten Charakteristik, Anamnese und Symptome: Bei den Rippen gibt es sowohl strukturelle als auch numerische Abweichungen. Abweichungen vom strukturellen Typ können entweder bifide, kurze oder verschmolzen Rippen sein. Zu den Anomalien der ersten Rippe gehört die schwimmende Rippe, zentrale Defekte, die durch Bänder überbrückt werden, rudimentäre Strukturen, die in einer Synostose enden oder Pseudoarthrosen mit der zweiten Rippe.

Wir berichten über den Fall eines 19-jährigen Patienten, der bei Z. n. Sturz beim Skifahren im Winter 2019 über Schmerzen im Bereich der rechten Schulter bzw. Clavicula klagte. Die klinische Untersuchung 4/2021 zeigte bei dem Patienten ein auffälliges, schmerzhaftes Knacken im Bereich der linken Clavicula, das insbesondere bei Abduktion des Armes bzw. Heben der linken Schulter auftrat. In diesem Bereich war auch eine Verdickung tastbar.

Diagnostik: Bei der 2019 primär auswärts durchgeführten Röntgendiagnostik wurde der Verdacht einer Fraktur der 2. Rippe li suszipiert, welche konservativ behandelt wurde. Da im weiteren Verlauf die Beschwerden des Patienten persistierten und zusätzlich ein schmerzhaftes Knacken im Bereich der li Clavicula auftrat, wurde bei V. a. Pseudoarthrose eine Thorax CT Untersuchung mit 3D Rekonstruktion der Clavicula an. Eine nochmalige CT 3D-Rekonstruktion nun der Rippen 4/2021 bestätigte eine Fraktur einer Synostose zwischen 1. und 2. Rippe links, mit sekundärer Kallusbildung und Einklemmung des Kallussporns unter der Clavicula.

Therapie: Im Rahmen einer operativen Resektion wurde schließlich der Sporn der 2. Rippe soweit reseziert, dass letztendlich die schmerzhaftes Krepitation bzw. Einklemmung postoperativ nicht mehr vorhanden war. 3 Monate nach der Primäroperation zeigt sich nun der Patient in völlig schmerzfreiem Zustand.

Literatur

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F14

Uniportale VATS Resektion vom Pancoast Tumoren

Igor Jankovic, Michael Müller, Mohamed Salama

Abteilung für Thoraxchirurgie, Klinik Floridsdorf-Krankenhaus Nord, Wien

Abb. 1 | F14

Abb. 2 | F14

Patienten Charakteristik, Anamnese und Symptome: Eine 35-jährige starke Raucherin klagte über Schmerzen in der rechten Schulter.

Diagnostik und Diagnose: In der Bildgebung ergab den Verdacht auf ein primäres Malignom im Apex der rechten Lunge mit Infiltration der Thoraxwand. Eine CT-gezielte Biopsie bestätigte ein NSCLC, NOS, MET-positiv, PD-L1: 90 %, negativ für ALK, KRAS, BRAF, RET, ROS1, PanTRK (T3, N1, M0).

Therapie: Eine neoadjuvante Chemo-immunotherapie mit 2 Zyklen Cisplatin, Gemcitabin, Pembrolizumab und Pegfilgrastim wurde eingeleitet. Anschließend erfolgte eine uniportale VATS Lobektomie des rechten Oberlappens, Lymphadenektomie sowie endoskopischer Thoraxwandresektion mittels VATS-Rib-Cutter. Ungestörter postop Verlauf, rasche Mobilisierung, max. CRP-Wert 36, WBC 14. Aufgrund erhöhter Drainagemengen Entlassung am 10. postop Tag. Definitive Histologie: pT0, pN0, M0. Zusammenfassung: Lokal fortgeschrittene thorakale Malignome können über uniportale VATS (UVATS) unter exzellenter Sicht minimal-invasiv radikal reseziert werden.

Literatur

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F15

30 Jahre nach Stammzelltransplantation ...

David Wanner¹, Markus Stein¹, Daniel Höfer², Christoph Krapf², Gabriel Putzer³, Doris Schreithofer⁴, Siglinde Giesinger⁴, Martin Hackl¹, Brigitte Bucher¹

¹Landeskrankenhaus Hochzirl-Natters, Standort Natters, Abteilung für Pneumologie

²Universitätsklinik für Herzchirurgie, Universitätsklinik Innsbruck

³Universitätsklinik für Anästhesie und Intensivmedizin, Universitätsklinik Innsbruck

⁴Landeskrankenhaus Hochzirl-Natters, Standort Natters, Abteilung für Anästhesie

Patienten Charakteristik, Anamnese und Symptome: Im Jahr 2014 wird ein damals 57-jähriger Patient aufgrund eines bei einer Routineuntersuchung entdeckten ca. 2 cm großen pulmonalen Rundherds im postero-/latero-basalen Unterlappen an unsere Abteilung überwiesen. Der Patient präsentiert sich zu diesem Zeitpunkt klinisch beschwerdefrei. In der Anamnese berichtet der Patient über eine vor 23 Jahren durchgeführte allogene Stammzelltransplantation bei aplastischer Anämie. Ansonsten bestehen keine weiteren Vorerkrankungen.

Diagnostik und Diagnose: Eine durchgeführte Bronchoskopie mit endobronchialen Ultraschall führt zu keiner Befunderweiterung. Erst eine CT-gezielte Punktion bringt die Diagnose einer cryptogenen organisierenden Pneumonie (COP). Dementsprechend wurde eine guideline-konforme Therapie eingeleitet und der Patient weiterführend im niedergelassenen Bereich betreut. Nach vier Jahren wird der Patient erneut an unserer Abteilung vorstellig. Er berichtet überzunehmende Belastungsdyspnoe in den letzten Monaten. Die durchgeführte pulmonologische Routinediagnostik zeigt eine restriktive Ventilationsstörung sowie eine zunehmende fibrosierende Komponente der COP. Nach weiteren Untersuchungen wird eine medikamentös-toxische Langzeitfolge der Stammzelltransplantation als ursächlich definiert. In den folgenden Monaten verschlechtert sich die respiratorische Symptomatik kontinuierlich, sodass aufgrund der progredienten Fibrosierung die Indikation zur Lungentransplantation gestellt wird und der Patient nach entsprechenden Voruntersuchungen gelistet wird.

Therapie: Im Januar 2021 kommt es aufgrund eines respiratorischen Infektes, erneut zu einer deutlichen Verschlechterung des Allgemeinzustandes (HU-Listung). Im Rahmen einer routinemäßigen zentralvenösen Katheter-Anlage kommt es zur respiratorischen Dekompensation. Trotz intensiver Beatmaßungsmaßnahmen werden keine suffizienten Sättigungswerte erzielt. Wir entschließen uns, nach Rücksprache mit den Kollegen der Herzchirurgie, zur Anlage einer veno-venösen ECMO. Diese wird vom mobilen ECMO-Team der Herzchirurgie an unserer endoskopischen Abteilung komplikationslos angelegt. Anschließend erfolgt die Transferierung an die Transplant-Intensivstation der Universitätsklinik Innsbruck. Fünf Tage nach respiratorischer Dekompensation erfolgt die Lungentransplantation, welche komplikationslos verläuft. Der Patient wird am elften post-operativen Tag von uns übernommen und

kann nach weiteren fünf Wochen in gutem Allgemeinzustand nach Hause entlassen werden.

OGTC FREIE VORTRÄGE

OPEN TOPIC ORAL PRESENTATIONS OF THE ASTS

V01

The effect of prone positioning after lung transplantation – a single center experience

Anna Elisabeth Frick^{*1}, Judith Schiefer², Mathias Maleczek², Stefan Schwarz¹, Alberto Benazzo¹, Anna Rath¹, Askin Kulu¹, Richard Hritcu¹, Peter Faybik², Walter Klepetko¹, Peter Jaksch¹, Konrad Hoetzenecker¹

¹Department of Thoracic Surgery, Medical University Vienna, Vienna, Austria

²Department of Anaesthesiology, Intensive Care Medicine and Pain Management, Medical University Vienna, Vienna, Austria

Introduction: Prone positioning (chest/face down and back up) became a standard treatment for acute respiratory distress syndrome (ARDS) patients to improve impaired gas exchange. The aim of this study was to evaluate the potential benefit of prone positioning (PP) after lung transplantation (LTx) in patients with impaired primary gas exchange.

Methods: We retrospectively analyzed LTx recipients between 01/2014 and 12/2019 ($n=553$). Of whom, 165 patients (29.8 %) were placed in PP. A subgroup analysis was performed for patients in PP on prolonged extracorporeal membrane oxygenation (ECMO).

Results: In total, 155 (28 %) patients were placed in PP immediately after LTx for a median of 19 (15–26) hours. Before PP, median PO_2/FiO_2 (P/F ratio) was 179 (120–280) mmHg and median dynamic lung compliance (C_{dyn}) was 24.1 (18.3–30.6) ml/cmH₂O. Both parameters significantly increased after proning—median P/F ratio increased to 353 (255–414; $p<0.0001$) mmHg and median C_{dyn} to 28.3 (21.3–35.2; $p=0.008$) ml/cmH₂O. 41 patients were placed in PP while being supported by postoperatively prolonged femoro-femoral veno-arterial (VA) ECMO. No complications related to PP (such as kinking of ECMO lines, dislocation of ECMO cannulas) were reported. Further, in this subgroup, P/F ratio (148 (81.3–219.3) mmHg to 317 (153.9–403.3) mmHg; $p=0.0002$) and C_{dyn} (16.6 (12.2–26.4) ml/cmH₂O to 21.8 (14.6–29.8) ml/cmH₂O; $p=0.05$) improved significantly by proning. Length of mechanical ventilation, of intensive care unit (ICU) and hospital stay were significantly longer with a median of 2 (1.8–9.3), 12 (7–29) and 35 (21–53) days in the proning group compared to 1.4 (0.9–2.8), 7 (4–13) and 25 (18–37) days in the non-proning group (all $p<0.0001$).

Conclusion: We could demonstrate in this study, that proning after LTx in patients with a complex postoperative course, significantly improves oxygenation. Our results show that placing patients in proning after LTx with prolonged ECMO support is feasible and safe.

V02

The Impact of COVID-19 on Thoracic Surgical Performance – an Exploratory Retrospective Study of an Austrian Thoracic Surgery Department

Nicole Ratschke*, Beatrice Marzluf, Michael Müller, Mohamed Salama

Department of Thoracic Surgery, Clinic Floridsdorf, Vienna, Austria

Background: In December 2019, media outlets announced that the Chinese city of Wuhan was struck by a pneumonia-like virus, dubbed as SARS-CoV-2, which quickly spread worldwide. A state of pandemic was officially declared by the WHO on 11th of March 2020. The pandemic dramatically changed the function of hospitals across European countries including Austria. Surgery departments were required to postpone or stop their regular operations. Thoracic surgery departments faced the challenge that due to the urgent nature of the surgical necessities the majority of surgeries could not be postponed or canceled. This study aims to analyze the effects of the COVID-19 pandemic on the performance of a thoracic surgery department after the first lockdown.

Methods: This retrospective study performed at the thoracic surgery department of the Clinic Floridsdorf analyzes the volume and spectrum of thoracic surgeries after the first COVID-19 lockdown. The total weekly number of operations, urgent and elective surgeries, and benign or malignant diseases were extracted from the electronic databases and compared for the periods of 01.09.2019 to 15.03.2020 (before lockdown) and 16.3. to 30.06.2020 (after lockdown).

Results: The overall number of surgeries performed from before lockdown was 547. No significant change within the total weekly volume of thoracic surgeries was observed after the lockdown compared to before (12.7 ± 3.0 vs. 14.3 ± 3.7 ; $p = 0.07$). A statistically significant decrease of weekly operations after the lockdown was found for elective surgeries (8.4 ± 2.5 vs. 10.3 ± 3.1 , $p = 0.022$), which only affected elective benign diseases (1.5 ± 1.0 vs. 2.9 ± 1.9 , $p = 0.0027$). Weekly elective surgeries on malignant diseases showed no significant changes between the time periods after compared to before the lockdown (6.3 ± 2.1 vs. 6.5 ± 2.4 , $p = 0.377$).

Conclusion: Although the COVID-19 pandemic necessitated restrictions on medical performance, the thoracic surgery department at the clinic Floridsdorf largely managed to maintain surgery volumes, especially concerning surgeries of malignant and urgent indications.

V03

Surgical repair of iatrogenic tracheobronchial injury (TBI) – a single-center retrospective analysis

Matthias Evermann^{*1}, Imme Roesner², Doris-Maria Denk-Linnert², Shahrokh Taghavi¹, Walter Klepetko¹, Konrad Hoetzenecker¹, Thomas Schweiger¹

¹Department of Thoracic Surgery, Medical University of Vienna, Austria

²Division of Phoniatrics and Logopedics, Department of Otorhinolaryngology, Medical University of Vienna, Austria

Background: Iatrogenic tracheobronchial injury (TBI) is a rare but serious complication of endotracheal intubation and tracheostomy. Surgery is usually indicated in patients with progressive clinical symptoms or when they are dependent on mechanical ventilation. Although a variety of surgical approaches and techniques have been described, data including a meaningful number of patients is sparse.

Material and method: In this retrospective analysis, all patients who received surgery for iatrogenic tracheobronchial injury (TBI) at the Department of Thoracic Surgery, Medical University of Vienna, between January 1999 and May 2021 were analyzed. Conservatively managed patients were excluded. The study was approved by the Ethics Committee of the Medical University of Vienna (2426/2020).

Result: 50 patients were included in the final analysis. The median age was 68 years (17–88), 76 % of the patients were female and 24 % were male. Emergency intubation (48 %), percutaneous dilatation tracheostomy (38 %) and elective intubation (14 %) were the most common causes of TBI. The median length of the tear was 50 mm (20–100 mm), with the distal third of the trachea (28 %), mid-distal trachea (22 %) and tracheobronchial transition (20 %) most commonly involved. Cervicotomy (52 %) was the preferred surgical approach over thoracotomy (38 %), which was particularly used in the early years. Peri-operative ECMO support was required in six (12 %) patients. There was no intraoperative mortality and no postoperative anastomotic dehiscence or stenosis. However, the severe underlying medical conditions of most patients, limited the overall outcome (30-day mortality of 40 %).

Conclusion: Iatrogenic TBIs can be managed successfully and safely by open surgical repair. The preferred surgical access should be a cervical incision as even distal injuries extending into the right main bronchus can be sufficiently exposed.

V04

Completion Pneumonectomy for Second Primary/Primary Lung Cancer and Local Recurrence Lung Cancer

Naofumi Miyahara², Alberto Benazzo^{*1}, Kazuhito Nii², Akinori Iwasa², Walter Klepetko¹, Konrad Hoetzenecker¹

¹Medical University of Vienna, Department of Thoracic Surgery, Wien, Austria

²Department of General Thoracic Surgery, Breast and Endocrinological Surgery, Japan

Background: Completion pneumonectomy (CP) for second primary/primary lung cancer (SPLC) and local recurrence lung cancer (LRLC) is still controversial. Although several case series on such a practice exist, the oncological benefit is under debate. The purpose of this study was to review available literatures on CP for SPLC and LRLC and evaluate postoperative and long-term outcomes.

Methods: MEDLINE, SCOPUS and Web of Science were reviewed for eligible studies in January 2021. Studies were included if they indicated outcomes of patients with lung cancer undergoing CP. Overall survival (OS) was defined as the primary end point; secondary end points included operative morbidity and 30-day mortality. Random-effects meta-analysis based on a binomial distribution was used to create pooled estimates.

Results: Thirty-two eligible studies including 1,157 patients were identified. These studies were uniformly retrospective reports. Pooled estimates for 3- and 5-year OS were 50.6 %

[95 % confidence interval (CI) 34.7–66.5] and 38.9 % [95 % CI 32.2–46.1] in SPLC patients. When the SPLC was a stage I tumor, pooled 5-year OS was favorable with 60.7 % [95 % CI 43.2–75.9]. In LRLC, pooled 3- and 5-year OS were 47.6 % [95 % CI 36.1–59.4] and 33.8 % (95 % CI 26.8–41.5). Pooled morbidity and 30-day mortality was reported in 38.2 % (95 % CI 32.0–44.9), and 10.0 % (95 % CI 8.1–12.3).

Conclusions: CP for SPLC and LRLC is a challenging procedure with significant perioperative morbimortality. However, published evidence indicates good long-term survival for selected patients. Further studies are needed to identify patient subgroups which benefit most from CP

V05

Preoperative lymphocyte-to-monocyte-ratio is prognostic after surgery for SCLC: a single-center retrospective analysis

Felix Egger^{*1}, Alessandro Querner¹, Felicitas Oberndorfer², Anna Schwendenwein¹, Zsuzsanna Valko¹, Karin Schelch¹, Thomas Klikovits³, Konrad Hoetzenecker¹, Balazs Döme¹, Christian Lang¹

¹Department of Thoracic Surgery, Comprehensive Cancer Center Vienna, Medical University of Vienna, Austria

²Clinical Institute of Pathology, Medical University of Vienna, Austria

³Division of Thoracic Surgery, Clinic Floridsdorf, Vienna, Austria

Introduction: Surgery is rarely performed in Small Cell Lung Cancer (SCLC) and clinical outcome data vary within the literature. Lymphocyte-to-monocyte ratio (LMR) has been already investigated as a biomarker for clinical outcome in non-surgical SCLC populations. The aim of this study was to determine the value of LMR in surgically treated SCLC patients.

Methods: All patients who underwent surgery for SCLC at the Medical University of Vienna between 2000 and 2019 were included. LMR prior to surgical resection was used. Overall survival (OS, time from surgery until last follow-up) and disease-free survival (DFS, defined as time from surgery until local recurrence or metastasis) were calculated by Kaplan-Meier method and the log-rank test. The optimal cut-off value of LMR for OS and DFS was determined by using X-tile software ©.

Results: In total, 77 patients were included (Fig. 1A). Of these, 28 were female, median age was 63.9 years and 50 patients received adjuvant chemotherapy. Median OS and DFS were 30.07 and 21.2 months, respectively (Fig. 1B + 1E). However, patients receiving adjuvant chemotherapy had significantly longer median OS (36.42 vs 15.77 months, $p < 0.001$, Fig. 1C) and DFS (25.9 vs 15.77 months, $p = 0.003$, Fig. 1F).

Regarding LMR, statistically significant ($p < 0.05$) cut-off values for OS and DFS were calculated as 3.00 and 2.00. Interestingly, patients with a LMR greater than 3 had a significantly longer OS (median 41.3 vs 21.03 months, $p = 0.02$, Fig. 1D). Furthermore, patients with a LMR above 2 showed a significantly longer median DFS when compared to patients below the cut-off values (24.1 vs 21.03 months, $p = 0.041$, Fig. 1G).

Conclusion: Elevated LMR is associated with a clinically favorable prognosis in patients undergoing surgical resection for SCLC. Nevertheless, further studies including higher numbers of patients are required to clearly determine the prognostic value of LMR in SCLC.

Gender	Female	28
	Male	49
Age (median, years)		63.9
Adjuvant chemotherapy	Yes	50
	No	23
Stage	I	30
	II	23
	III	22
	IV	2
Overall Survival (median, months)		30.07
Disease Free Survival (median, months)		21.2

a

Fig. 1 | V05

V06

Lobar resection is associated with improved clinical outcome in SCLC: a retrospective two center analysis

Alessandro Saeed Querner¹, Felix Egger¹, Felicitas Oberndorfer⁴, Judit Moldvay², Ferenc Renyi-Vamos², Konrad Hoetzenecker¹, Karin Schelch¹, Thomas Klikovits⁵, Mir Alireza Hoda¹, Balazs Döme¹, Christian Lang¹

¹Department of Thoracic Surgery, Comprehensive Cancer Center Vienna, Medical University of Vienna, Vienna, Austria

²National Korányi Institute of Pulmonology, Budapest, Hungary

³Department of Thoracic Surgery, Semmelweis University and National Institute of Oncology, Budapest, Hungary

⁴Clinical Institute of Pathology, Medical University of Vienna, Vienna, Austria

⁵Division of Thoracic Surgery, Clinic Floridsdorf, Vienna, Austria

Introduction: The vast majority of small-cell lung cancer (SCLC) patients are diagnosed with advanced-stage disease and thus, surgical resection of the primary tumor is rarely indicated. However, with upcoming lung cancer screening programs, the number of limited-stage SCLC patients is likely to rise. The aim

Fig. 1 | V06

of our two-center study was to investigate the impact of different surgical approaches on clinical outcomes in SCLC patients.

Patients and Methods: All patients, who underwent surgery for SCLC at the Medical University of Vienna (between 2000 and 2019) or National Korányi Institute of Pulmonology, Budapest (between 1999 and 2017) were retrospectively included. Patients with inadequate clinicopathological data or distant metastasis ($\geq M1$) at diagnosis were excluded. Overall survival (OS, time from surgery until last follow-up) and disease-free survival (DFS, defined as the time from surgery until local recurrence or metastasis) were correlated with different types of surgical resection.

Results: In total, 157 patients were included. 15 Patients received wedge resection and 13 underwent segmentectomy (defined as sublobar resection). In contrast, 109 and 20 Patients underwent lobectomy or pneumonectomy, respectively (defined as lobar resection).

In the whole study cohort, median OS and DFS were 27.2 and 176.3 months, respectively (Fig. 1a and d). Notably, adjuvant chemotherapy (CHT) was associated with significantly longer median OS (35.4 vs 20.9 months; Fig. 1b) and DFS (23.5 vs 15.8 months; Fig. 1e). Moreover, patients undergoing lobar resection showed a tendency towards longer OS (median 29.4 vs 19.4, Fig. 1c) and had a significantly longer DFS (176.3 vs 17.5 months, $p=0.0193$, Fig. 1f) compared to patients receiving sublobar resection.

Conclusion: Lobar resection and adjuvant chemotherapy associate with improved clinical outcomes in surgically-treated SCLC patients. Nevertheless, more prospective studies on larger patient cohorts are needed to investigate the impact of different resection methods and adjuvant treatment strategies in this devastating disease.

V07

Pulmonary artery to ascending aorta ratio predicts survival of patients with chronic thromboembolic pulmonary hypertension undergoing pulmonary endarterectomy

Panja Maria Böhm^{*1}, Stefan Schwarz¹, Jürgen Thanner¹, Cecilia Veraar², Mario Gerges³, Christian Gerges³, Irene Lang³, Paul Apfalter⁴, Helmut Prosch⁴, Shahrokh Taghavi¹, Walter Klepetko¹, Hendrik Jan Ankersmit¹, Bernhard Moser¹

¹Department of Thoracic Surgery, Medical University of Vienna, Vienna, Austria

²Division of Cardiac Thoracic Vascular Anaesthesia and Intensive Care Medicine, Department of Anaesthesia, Intensive Care Medicine and Pain Medicine, Medical University of Vienna, Vienna, Austria

³Division of Cardiology, Department of Medicine II, Medical University of Vienna, Vienna, Austria

⁴Department of Biomedical Imaging and Image-Guided Therapy, Medical University of Vienna, Vienna, Austria

Introduction: The ratio of pulmonary artery (PA) and ascending aorta (AA) diameters has recently been shown to be a useful indicator for disease severity and predictor of outcome in patients with pulmonary hypertension and heart failure. This study aimed at evaluating the applicability of this ratio for perioperative risk assessment of patients with chronic thromboembolic pulmonary hypertension (CTEPH) undergoing pulmonary endarterectomy (PEA).

Methods: In this retrospective cohort study on 149 patients undergoing PEA between 2013 and 2020 the preoperative PA:AA ratio was analysed on axial computed tomography (CT). Variables of pulmonary hemodynamics were assessed during preoperative right heart catheterisation and postoperative Swan-Ganz catheter measurements.

Results: Preoperative CT measurements showed a median AA diameter of 31 mm (range: 19–47), and a median PA diameter of 36 mm (range: 25–55). The calculated median PA:AA ratio was 1.13 (range: 0.79–1.80). PA:AA ratio correlated positively with PAP (sPAP: $r=0.352$, $p<0.001$; dPAP: $r=0.406$, $p<0.001$; mPAP: $r=0.318$, $p<0.001$) and inversely with age ($r=-0.484$, $p<0.001$). Univariable Cox regression analysis identified PA diameter ($p=0.008$) as a preoperative variable predictive of survival. There was a significant difference (log-rank $p=0.037$) in 30-day survival probability for patients with lower PA:AA ratios (<1.136 ; survival probability: 97.4 %) compared to patients with higher ratios (>1.136 ; survival probability: 88.9 %).

Conclusions: PA:AA ratio shows a strong correlation with other variables associated with pulmonary hypertension. In the preoperative setting, PA diameter is a predictor of perioperative risk. In addition, patients with higher PA:AA ratios have lower survival probabilities after PEA.

V08

Outcome of neoadjuvant or adjuvant radiotherapy in multimodality setting with extrapleural pneumonectomy for malignant pleural mesothelioma

Berta Mosleh^{*1}, Thomas Klikovits¹, Andrea Reim², Richard Hritcu¹, Katharina Sinn¹, Sabine Zöchbauer-Müller³, Wolfgang Köstler³, Georg Lang¹, Karin Dieckmann², Joachim Widder², Walter Klepetko¹, Konrad Hötzenecker¹, Mir Alireza Hoda¹

¹Department of Thoracic Surgery, Medical University of Vienna, Vienna, Austria

²Department of Radiation Oncology, Comprehensive Cancer Center, Medical University Vienna, Vienna, Austria

³Department of Oncology, Comprehensive Cancer Center, Medical University Vienna, Vienna, Austria

Objectives: Extrapleural pneumonectomy (EPP) was reported to offer favourable long-term outcome for selected patients with malignant pleural mesothelioma when performed within a multimodality setting including chemo- and/or radiotherapy. The optimal sequence of treatment modalities is yet to be defined. We analyzed peri-operative morbidity and long-term outcome of patients who underwent EPP when combined with neoadjuvant or adjuvant pleural intensity modulated radiotherapy (IMRT)/volumetric modulated arc therapy (VMAT) with or without chemotherapy at a tertiary thoracic oncology reference center.

Methods: Our prospective single-center database was reviewed for patients undergoing a curative intent treatment protocol including EPP and IMRT/VMAT and partly chemotherapy between 2005 and 2018, and retrospectively analyzed.

Results: In total, 59 patients (mean age 59 years; male, $n=48$ (81 %)) were identified. 47 patients underwent the institutional standard trimodality treatment consisting of induction chemotherapy, EPP, and adjuvant pleural IMRT/VMAT (adjuvant IMRT/VMAT group). Starting from 2016, neoadjuvant IMRT/VMAT was included in the institutional standard approach, and 12 patients received neoadjuvant IMRT/VMAT with prior ($n=9$) or without ($n=3$) chemotherapy followed by EPP (neoadjuvant IMRT/VMAT group). Most patients had the histological epitheloid subtype (85 %) and pathological stage I disease (79 %, TNM 8th Edition). The postoperative complication rate was 45 % without differences between neoadjuvant or adjuvant IMRT/VMAT. The median overall survival (OS) of all patients was 23 months, and 3- and 5-year OS rates were 31 % and 25 %, respectively. There was no significant survival difference between patients receiving neoadjuvant versus adjuvant IMRT/VMAT with slightly prolonged OS after adjuvant IMRT/VMAT (median OS 24 vs. 17 months, hazard ratio 0.717, $p=0.39$).

Conclusion: Neoadjuvant pleural IMRT/VMAT prior to EPP is currently investigated as a new treatment option for highly selected MPM patients. In our experience, neoadjuvant IMRT/VMAT with or without prior chemotherapy was safe, but showed no relevant survival benefit compared to adjuvant IMRT/VMAT in a multimodality treatment setting.

V09

Impact of awake versus sedated ECMO bridge-to-transplant strategies on early and long-term outcome after lung transplantation

Florian Ponholzer^{*}, Stefan Schwarz, Peter Jaksch, Alberto Benazzo, Konrad Hoetzenecker, Thomas Schweiger

Division of Thoracic Surgery, Medical University of Vienna, Vienna, Austria

Introduction: Bridge-to-transplant (BTT) using extracorporeal membrane oxygenation (ECMO) is a viable option in selected patients with end-stage lung disease. Traditionally, patients on BTT-ECMO were kept sedated and intubated, however, ambulatory/awake ECMO strategies have been developed during the last years. This study aims to elaborate the differences in early and long-term outcomes after lung transplantation (LUTX) of awake versus sedated BTT patients.

Methods: All BTT-patients receiving a LUTX at the Department of Thoracic Surgery, Medical University of Vienna, between 03/2013 and 04/2021 were retrospectively analyzed. Patients were considered awake if they had an equivalent of a Richmond Agitation-Sedation Scale score of -1 or higher until at least 24 h before transplantation.

Results: A total of 88 patients were included in the final analysis (awake: $n=35$, 39.8 %; sedated: $n=53$, 60.2 %). There was no significant difference in patient demographics. Awake BTT patients had non-significant tendency towards shorter mean preoperative BTT (9.17 (1-80) vs. 12.36 (0-60) days, $p=0.315$). 35.7 % of awake BTT patients were able to perform active physiotherapy lying in bed, 25.0 % sitting and 39.3 % standing despite ECMO, while also achieving earlier mobilization to standing position after transplantation (8.69 vs. 18.04 days, $p<0.001$). Postoperative ventilation time (155.86 vs. 325.57 hours, $p=0.001$) and postoperative intensive care unit (ICU) stay (20.57 vs. 33.48 days, $p=0.004$) was significantly shorter in the awake cohort.

No difference was found regarding the rate of ECMO associated or severe complications (20.0 % vs. 18.9 %, $p=1.000$; 31.4 % vs. 34.0 %, $p=1.000$). One-year and five-year overall survival did not differ (71.8 % vs. 69.1 %, $p=0.884$; 61.9 % vs. 57.2 %, $p=0.966$).

Conclusion: Awake BTT concepts are associated with a significantly faster postoperative recovery and a shorter ICU stay compared to sedated strategies. Comparable long-term outcome can be achieved in both awake and sedated BTT-patients. Even several weeks of sedated ECMO support should not be considered a contraindication for LUTX.

V10

Modified Glasgow prognostic score and fibrinogen levels in patients with stage III/N2 non-small cell lung cancer after neoadjuvant treatment

Katharina Sinn^{*1}, Berta Mosleh¹, Gyoergy Lang¹, Shahrokh Taghavi¹, Konrad Hoetzenecker¹, Sabine Zochbauer², Karin Dieckmann³, Joachim Widder³, Helmut Prosch⁴, Daniela Gompelmann⁵, Michael Grusch², Walter Klepetko¹, Thomas Klikovits¹, Mir Alireza Hoda¹

¹Medical University of Vienna, Vienna, Austria

²Division of Oncology, Department of Medicine I, Comprehensive Cancer Center Vienna Medical University Vienna, Vienna, Austria

³Department of Radiation Oncology, Comprehensive Cancer Center Vienna, Medical University Vienna, Vienna, Austria

⁴Department of Biomedical Imaging and Image-guided Therapy, Medical University Vienna, Austria

⁵Department of Pulmonology, Medical University Vienna, Vienna, Austria

Introduction: This study investigates the prognostic value of the modified Glasgow prognostic score (mGPS) and fibrinogen plasma levels in patients with stage III/N2 non-small cell lung cancer (NSCLC) at time of first diagnosis and after neoadjuvant treatment followed by radical surgery.

Methods: Data from 84 patients who had initially stage III/N2 NSCLC and received neoadjuvant therapy followed by complete surgical resection from 2000 to 2013 were retrospectively analyzed. All parameters for mGPS and fibrinogen levels were measured at time of diagnosis and after neoadjuvant treatment at time of admission for surgery. Clinical data including histology, type of neoadjuvant therapy, type of surgery and survival were retrospectively collected. The association between mGPS, fibrinogen and survival was analyzed using log-rank and Cox regression analysis adjusted for clinical and pathological factors.

Results: After neoadjuvant treatment mean serum fibrinogen level of the entire study population was 464.32 mg/dL (134.51 mg/dL). Fifty-five (68.75 %) patients had a mGPS of 0, 19 patients (23.75 %) had a mGPS of 1 and 6 patients (7.5 %) had a mGPS of 2 (in 4 patients albumin levels were missing). Increased fibrinogen level (>400 mg/dL) prior to surgery conferred significant disadvantage for OS (HR 0.562, $p=0.048$ and HR 0.563, $p=0.045$, in univariate analysis respectively. However, type of induction therapy was found to be the only independent prognostic factor after multivariate analysis (HR 0.365, 95 % CI 0.192–0.694, $p=0.002$), whereas all other parameters including fibrinogen had no independent prognostic impact on OS in our study population. A decrease in fibrinogen level (20 %) and mGPS between pre- and post neoadjuvant therapy showed longer OS and DFS, but without statistical significance.

Conclusions: In our cohort patients with increased fibrinogen levels after neoadjuvant treatment had shorter OS in univariate analysis. However, Well-designed, randomized controlled trials are warranted to clarify the value of those biomarker.

V11

Sarcopenia and mediastinal adipose tissue as a prognostic marker for short and long-term outcome after anatomic video-assisted thoracoscopic resection for lung cancer

Florian Ponholzer^{*}, Georg Groemer, Caecilia Ng, Herbert Maier, Paolo Lucciarini, Dietmar Öfner, Florian Augustin

Department of Visceral, Transplant and Thoracic Surgery, Center of Operative Medicine, Medical University of Innsbruck, Innsbruck, Austria

Introduction: Surgical resection remains the gold standard of treatment for early stage lung cancer. Several risk models exist to predict postoperative morbidity and mortality. Psoas muscle sarcopenia has already successfully been used for morbidity prediction in lung transplantation and is not included in the available risk scores for pulmonary resections. We hypothesized that skeletal muscle index and mediastinal adipose tissue also have an impact on postoperative outcome after primary surgery for primary lung cancer.

Methods: The institutional database was queried for patients with primary lung cancer who were treated with primary surgery between 02/2009 and 11/2018. A total of 311 patients was included for analysis. Patients receiving neo-/adjuvant chemotherapy or with positive nodal status were excluded. Sarcopenia was defined according to Derstine et al. as a skeletal muscle index <34.4 cm²/m² for women and <45.4 cm²/m² for men.

Results: Sarcopenia was diagnosed in 78 (25.1 %) of 311 patients. Male patients were significantly more likely to suffer from sarcopenia (31.5 % vs. 18.1 %, $p=0.009$). Comorbidities, lung function, tumour histology, pathologic tumour staging, mediastinal adipose tissue and age did not differ between groups with or without sarcopenia. Sarcopenic patients had a significantly longer length of stay with 13.0 days vs. 9.5 ($p=0.003$) and a higher rate of postoperative complications (59.0 % vs. 44.6 %, $p=0.036$). There was no difference in recurrence rate or long-term morbidity. Five-Year overall survival was significantly better in the patient cohort without sarcopenia (75.6 % vs. 64.5 %, $p=0.044$). Mediastinal adipose tissue showed no significant impact on length of stay, postoperative complications, recurrence rate, long-term morbidity or survival.

Conclusion: Sarcopenia shows to be a risk factor for postoperative morbidity and reduced survival for primary lung cancer. Efforts should be taken to preemptively screen for sarcopenia and start countermeasures (e.g. physical prehabilitation, protein-rich nutrition, etc.) during the preoperative workup phase.

V12

Salvage pneumonectomy in lung cancer with septic complication carries high perioperative risk

Melanie Fediuk^{*1}, Nicole Fink-Neuboeck¹, Christian Porubsky¹, Angelika Terbuch², Philipp Douschan³, Amir Koutp¹, Luka Brcic⁴, Alfred Maier¹, Jörg Lindenmann¹, Josef Smolle⁵, Freyja-Maria Smolle-Jüttner¹

¹Division of Thoracic and Hyperbaric Surgery, Department of Surgery, Medical University of Graz, Graz, Austria

²Division of Oncology, Department of Internal Medicine, Medical University of Graz, Austria

³Division of Pulmonology, Department of Internal Medicine, Medical University of Graz, Austria

⁴Diagnostic and Research Center, Institute of Pathology, Medical University of Graz, Austria

⁵Institute of Medical Informatics, Statistics and Documentation, Medical University of Graz, Austria

Background: Patients with advanced lung cancer may develop pneumonia, pleural empyema and sepsis. In order to restore or to enable systemic therapy, tumor boards decide for salvage resection, which in some cases entail pneumonectomy. We evaluated the results of these procedures.

Methods: 133 patients with advanced lung cancer (age: 60.8 years; males: 103, females: 30) underwent pneumonectomy. 22 of them were resected for an underlying septic condition deriving from post-stenotic abscess and/or empyema, 111 underwent pneumonectomy for uncomplicated cancer.

Results: Mean age in the septic patients did not differ from the controls, but septic patients had a significantly lower BMI ($p=0.019$). Staging in the septic group was pT1: 3; pT2: 8; pT3: 5; pT4: 6; pN1:13; pN2: 8, pN3: 1, in contrast, pT0: 3, pT1: 20; pT2: 51; pT3: 28; pT4: 9; pN1: 49; pN2: 34 in elective pneumonectomies, with a significant difference for pN ($p=0.009$). The rates of perioperative complications (90.9 % vs. 73.9 %) and particularly of perioperative death (50 % vs. 4.50 %) were significantly higher in patients undergoing salvage for inflammatory complication ($p<0.001$). Survival was significantly poorer in septic patients (HR 2.5; $p=0.001$), with 5-year survival rates of 15 % and 30 %, respectively. However, once 2 months are survived, there is no further prognostic difference.

Conclusion: Though sometimes indicated as an acute life-saving procedure in severe inflammatory complications of advanced lung cancer, pneumonectomy is associated with a high perioperative morbidity and mortality. If the first 2 months after pneumonectomy are survived, however, the prognosis between both subgroups does not differ anymore.

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P01

Markers of endothelial integrity and activation in pulmonary fibrosis

Elisabeth Fließer^{*1}, Anna Birnhuber¹, Panja Böhm², Konrad Hötzenecker², Gabor Kovacs³, Horst Olschewski³, Grazyna Kwapiszewska^{1,4}

¹Ludwig Boltzmann Institute for lung vascular research, Graz, Austria

²Division of thoracic surgery, Department of surgery, Medical University of Vienna, Vienna, Austria

³Division of pulmonology, Department of inner medicine, Medical University of Graz, Graz, Austria

⁴Otto Loewi Research Center, Medical University of Graz, Graz, Austria

Background: Pulmonary fibrosis (PF) is a progressive lung scarring disorder associated with high morbidity and mortality. So far, maladaptive cellular and molecular alterations were assumed mainly epithelial-driven. However, evidence is growing, that endothelial cells (EC) significantly contribute to disease onset and progression, but detailed information on EC characteristics is still sparse. Here, we provide a thorough analysis of vascular markers implicated in EC integrity and activation both locally in the lung and in the systemic circulation.

Methods: Gene expression levels of the surface markers CD31/PECAM1, VE-Cadherin/CDH5, von Willebrand Factor/VWF, thrombomodulin/THBD and VEGFR-2/KDR as well as activation markers intercellular adhesion molecule 1-3/ICAM1-ICAM3, vascular cell adhesion molecule 1/VCAM1 and P-Selectin/SELP were determined in PF ($n=18$) and donor lung tissue ($n=19$) using quantitative RT-PCR. ELISA was conducted to determine plasma levels of the corresponding markers in PF patients ($n=18$) and controls ($n=29$) and FFPE lung tissue sections from PF patients and donors were used for multicolor immunofluorescence labeling.

Results: Local gene expression levels of thrombomodulin, ICAM-2 and ICAM-3 were significantly decreased in PF lung tissue compared to donors ($p=0.0500$, $p=0.0041$, $p=0.0015$, respectively). Systemically, EC surface markers VE-Cadherin, thrombomodulin and VEGFR-2 were significantly reduced, whereas EC activation markers vWF, P-selectin and IL-8 were significantly elevated. Moreover, soluble vWF and expression levels of CD31 and P-selectin showed an inverse correlation with the patients' lung function ($r=-0.39$, $p=0.018$, $r=-0.53$, $p=0.025$, $r=-0.78$, $p=0.04$, respectively).

Conclusion: Our results support the presence of a dysregulated vascular compartment in PF and suggest a direct association with restrictive lung function and gas exchange impairment. Thus, plasma vWF, P-selectin and IL-8 could qualify as potential future biomarkers for PF.

P02

ISARS-CoV-2 induces hyperinflammation in human macrophages via TLR4

Sabina Sahanic^{*1}, Richard Hilbe¹, Judith Löffler-Ragg¹, Günter Weiss¹, Doris Wilflingseder², Wilfried Posch², Ivan Tancevski¹

¹University Clinic for Internal Medicine II, Department of Internal Medicine, Innsbruck Medical University, Innsbruck, Austria

²Division of Hygiene and Medical Microbiology, Medical University of Innsbruck, Innsbruck, Austria

Introduction: Exaggerated inflammation significantly contributes to pulmonary failure and death in COVID-19. Our objective was to study the role of Toll-like receptors 3 (TLR3), TLR4 and TLR7/9 in human macrophages infected with SARS-CoV-2.

Methods: THP-1 derived human macrophages were challenged with the Spike protein ectodomain (SARS-CoV-2-ECD), or infected with viable SARS-CoV-2, including wildtype (Wuhan-Hu-1), as well as B.1.1.7, B.1351 and B.1.1.7-E484K variants. Inhibitors of SARS-CoV-2 entry and of specific TLR signaling cascades were used to delineate the inflammatory circuits.

Results: Human macrophages showed a marked time- and concentration-dependent inflammatory response when exposed to SARS-CoV-2-ECD, or to viable SARS-CoV-2. TLR4-specific inhibition suppressed the expression of inflammatory

TLR4-NF- κ B dependent cytokines >50 %, whereas inhibition of TLR3 and TLR7/9 pathways did not lead to an attenuated response. Importantly, inhibition of TLR4 suppressed the exaggerated inflammatory response also in human macrophages infected with variants of concern B.1.1.7, B.1.351 and B.1.1.7-E484K (Fig. A-D).

Conclusions: SARS-CoV-2 induces a hyperinflammatory response in human macrophages through Spike protein-dependent activation of TLR4. TLR4 constitutes a novel important target to counteract COVID-19 associated morbidity and death.

P03

Meta-analysis on the efficacy and specificity of microbiome-based biomarkers for predicting immune checkpoint inhibitor therapy response in non-small cell lung cancer patients

Christian Jansen^{*}, Alexander Knabl, Barbara Sladek, Nikolaus Gasche

Biome Diagnostics GmbH, Wien, Austria

Introduction: Immune checkpoint inhibitor (ICI) cancer therapies have emerged as a potent option for treatment of non-small cell lung cancer (NSCLC). ICI therapies fight the tumour through an up-regulation of the immune system and achieve a higher efficacy compared to traditional platinum-based chemotherapies. Major downsides of ICI-treatments are the varying response rates and sometimes even severe immune related adverse events (irAE).

Background and aim: To address these challenges one highly promising approach is to establish a prognostic biomarker—based on the intestinal microbiome. The complex ecosystem of the intestinal microbiome is strongly interconnected with the body's own immune system and hence has been a scientific focus for years as a potential biomarker to predict ICI therapy response as well as irAEs.

The aim of the presented study is to perform a meta-analysis of 16S amplicon sequencing data sets, examining the human gut microbiome for an ICI therapy response biomarker and to determine the specificity of such a pattern across studies and cancer types.

Results: The presented research recovers 6 16S amplicon sequencing data sets with a total of 221 Patients (112 responder, 109 non responder), encompassing both NSCLC (82) and melanoma (139) patients. After reanalysing the raw sequencing data using the same bioinformatic process we identify microorganisms with the highest predictive power utilizing a LEfSe (Kruskall-Wallis $\alpha < 0.05$) differential abundance analysis. The selected features are analysed using diverse machine learning techniques and validated with different cross validation methods. This ensures that the recovered patterns are valid across datasets.

Conclusion: Our presented results show that the genus *Faecalibacterium* and specific *Bacterioides* species strongly correlate with tumour response whereas the taxonomic classification of *Escherichia Shigella* is more significant in non-responders.

The preliminary data give hope for a clinical biomarker for ICI therapy response, which can help to improve cancer therapy outcomes for NSCLC and melanoma patients.

Submission by Biome Diagnostics GmbH

Fig. 1 | P02 THP-1 macrophages were infected with wild-type (Wuhan-Hu-1) and variants of concern B.1.1.7, B.1351 and B.1.1.7-E484K, w and w/o the TLR4 inhibitor TAK-242

P04

MicroRNAs expression in lung adenocarcinoma patients and healthy donors and its potential role as biomarker in lung cancer diagnostics

Irina Robinson*, Alexandra Bertsch, Katharina Leithner, Horst Olschewski, Andelko Hrzenjak

Clinical Department of Internal Medicine, Division of Pulmonology, Medical University of Graz, Graz, Austria

Background and aim: Lung adenocarcinoma (LUAD) is the most common type of lung cancer. MicroRNAs (miRNAs) have an important role in many biological regulation processes in non-malignant and in cancer cells. The aim of this study was to analyze the expression of miRNAs in A549 LUAD cells and in non-malignant bronchial epithelial (BE) cells from healthy donors after lung transplantation. The most dysregulated miRNAs were then analyzed in plasma samples of 18 LUAD patients and 18 healthy donors.

Methods: Expression of miRNAs in LUAD and BE cells was determined by RT-qPCR, using miRNA-panels with 752 different miRNAs. For data normalization, the mean-centering restricted method was used and miRNA expression levels were calculated by the $\Delta\Delta C_t$ method. The 18 most deregulated miRNAs were analyzed in plasma samples of 18 LUAD patients and 18 healthy donors using RT-qPCR.

Results: Out of 752 miRNAs, 37 miRNAs were significantly dysregulated (cut off $\Delta\Delta C_t = 1.5$; $p < 0.05$) in A549 cells in comparison to BE cells. Out of these 18 miRNAs, 10 were easily detectable in plasma samples. Four miRNAs (miR-15b-3p, miR-148a-3p, miR-193b-3p, and miR-195-5p) were significantly dysregulated in plasma samples of LUAD patients compared to healthy donors. Two miRNAs (miR-191-5p and miR-16-3p) were stably expressed in all plasma samples and therefore used for data normalization.

Conclusion: MiRNA expression in malignant vs. non-malignant bronchial epithelial cells showed striking differences. There were corresponding differences in miRNA expression in plasma samples of LUAD patients compared to healthy donors. A panel of four miRNAs from circulating plasma might represent a diagnostic biomarker for lung adenocarcinoma.

P05

Correlation of arterial and venous vessel numbers with risk parameters in pre-capillary pulmonary hypertension

Michael Pienn*¹, Roman J. Gertz², Felix Gerhardt³, Jan R. Kröger⁴, Hasan Zaytoun², Stephan Rosenkranz³, Horst Olschewski^{1,5}, Alexander C. Bunck²

¹Ludwig Boltzmann Institute for Lung Vascular Research, Graz, Austria

²Department of Radiology, Faculty of Medicine and University Hospital Cologne, University of Cologne, Cologne, Germany

³Department of Cardiology, Faculty of Medicine and University Hospital Cologne, University of Cologne, Cologne, Germany

⁴Division of Pulmonology, Department of Radiology, Johannes Wesling Clinic Minden, Minden, Germany

⁵Division of Pulmonology, Department of Internal Medicine, Medical University of Graz, Graz, Austria

Background: Pre-capillary pulmonary hypertension (PH) is a chronic disorder of the pulmonary circulation, marked by an elevated vascular resistance and arterial pressure. Cardiac index (CI), central venous oxygen saturation (SvO₂) and 6min walk distance (6MWD) are established surrogates for 1-yr mortality. Our objective was to investigate whether dilatation of peripheral lung vessels yields prognostic information.

Methods: In this retrospective study, patients were examined by contrast-enhanced thoracic CT and diagnostic or follow-up right heart catheterization (RHC). An in-house developed, fully automatic software extracted the peripheral vessels ranging between 2 and 10 mm diameter from the thoracic CT images. Consecutively, it labeled them as either arteries or veins. We performed correlation analysis of number of vessel segments in the diameter ranges 6–10 mm, 4–6 mm and 2–4 mm with surrogates for 1-yr mortality risk.

Results: One-hundred and twenty-two patients with pre-capillary PH were analyzed. Validation of the automatic artery/vein separation by a radiologist resulted in a median overlap of 85 % (range: 33–100 %). Patients with overlap less than 80 % were excluded from separate analyses of arteries and veins, leaving 81 for these analyses. While the numbers of all vessels in the three diameter ranges showed no or only weak correlations with the surrogates, there were several moderate correlations if arteries and veins were analyzed separately. Some of these correlations were in opposite directions. This explains why the ratios of arteries over veins showed stronger correlations with CI, SvO₂ and 6MWD with Spearman correlation coefficients of –0.64, –0.51 and –0.41, respectively, for vessels with diameters between 6–10 mm, and of –0.54, –0.43 and –0.31, respectively, for vessels with diameters 4–6 mm.

Conclusions: In pre-capillary PH, there is a gradual increase in the number of detectable arteries compared to veins in relation to 1-yr mortality risk.

P06

TREK-1 background potassium channel in pulmonary arterial smooth muscle cells: a new player in pulmonary arterial hypertension

Miklós Lengyel*^{1,2}, Chandran Nagaraj¹, Konrad Hötzenecker³, Andrea Olschewski¹, Péter Enyedi²

¹Ludwig Boltzmann Institute for Lung Vascular Research, Graz, Austria

²Semmelweis University, Department of Physiology, Budapest, Hungary

³Medical University of Vienna, Department of Thoracic Surgery, Vienna, Austria

Background: Pulmonary arterial hypertension (PAH) is a life threatening disease characterized by an increase in the pulmonary vascular resistance. Sustained depolarization leads to dysfunction of pulmonary arterial smooth muscle cells (PASMC), which is important in pathophysiology of the disease. The importance of the K2P channel TASK-1 is well known in PAH, however, the role of other K2P channels in PASMCs has not been examined yet.

Methods: PASMC cells were obtained from healthy (donor) and PAH human lung samples. Expression of K2P family channels in PASMCs was determined using qPCR. The functional relevance of TREK-1 was examined using patch clamp, calcium imaging and wire myography.

Results: TREK-1 was the K2P subunit with the highest expression level in donor PASMCs. Furthermore, TREK-1

mRNA levels were decreased in PAH PSMCs compared to the donor. Presence of functional TREK-1 current was confirmed by using the selective inhibitor, spadin. Inhibition of TREK-1 depolarized the membrane potential of donor cells to values comparable with the PAH cells. Activation of TREK-1 using ML-335 (TREK-1/TREK-2 activator) hyperpolarized the resting membrane potential of PSMCs. Silencing TREK-1 depolarized donor PSMCs. The hyperpolarization of PAH cells after ML-335 treatment was absent after silencing of TREK-1, confirming the specificity of ML-335. In calcium imaging experiments, inhibition of TREK-1 increased, while channel activation decreased the calcium signal in PSMCs evoked by extracellular acidification, a known pulmonary vasoconstrictor. In ex vivo wire myography experiments, application of ML-335 caused a dose-dependent vasorelaxation of the precontracted intrapulmonary artery.

Conclusions: TREK-1 is the most abundantly expressed K2P subunit and forms functional channels in human PSMCs. TREK-1 is a major determinant of the resting membrane potential and regulates the calcium signalling of PSMCs. Activating the channel causes relaxation in precontracted intrapulmonary arteries. Our results altogether suggest that TREK-1 can be a new target for the treatment of PAH.

P07

Selpercatinib in RET fusion-positive non-small-cell lung cancer (SIREN): an international, real-world analysis

Oliver Illini^{*1,2}, Maximilian Johannes Hochmair^{1,2}, Hannah Fabikan¹, Christoph Weinlinger¹, Amanda Tufman³, Aurélie Swaldutz⁴, Kristina Lamberg⁵, Sayed M. S. Hashemi⁶, Florian Huemer⁷, Anders Vikström⁸, Martin Wermke⁹, Gudrun Absenger¹⁰, Alfredo Addeo¹¹, Shantanu Banerji¹², Antonio Calles¹³, Stephen Clarke¹⁴, Massimo Di Maio¹⁵, Alice Durand¹⁶, Michaël Duruisseau^{16,17}, Malinda Itchins¹⁴, Okko-Sakari Kääräinen¹⁸, Florian Krenn¹⁹, Eckart Laack²⁰, Adrianus J de Langen²¹, Katja Mohorcic²², Georg Pall²³, Antonio Passaro²⁴, Gerald Prager²⁵, Achim Rittmeyer²⁶, Jeffrey Rothenstein²⁷, Michael Schumacher²⁸, Ewald Wöll²⁹, Arschang Valipour^{1,2}

¹Karl Landsteiner Institute for Lung Research and Pulmonary Oncology, Vienna, Austria

²Department of Respiratory and Critical Care Medicine, Klinik Floridsdorf, Vienna, Austria

³Medizinische Klinik und Poliklinik V, Klinikum der Universität München, LMU München, Mitglied des Deutschen Zentrums für Lungenforschung, CPC-M, Munich, Germany

⁴Centre Léon Bérard, Lyon, France

⁵Department of Pulmonary and Allergic diseases, Uppsala University hospital, Uppsala, Sweden

⁶Amsterdam UMC, VU University Medical Center, Cancer Center Amsterdam, Amsterdam, The Netherlands

⁷Department of Respiratory Care, Ludwig Boltzmann Institute Lung Health, Klinik Penzing, Vienna, Austria

⁸Pulmonary clinic, University hospital Linköping, Linköping, Sweden

⁹Technical University Dresden, Medical Faculty C.-G.-Carus, NCT/UCC Early Clinical Trial Unit, Dresden, Germany

¹⁰Department of Oncology, Medical University of Graz, Graz, Austria

¹¹Oncology Department, University Hospital of Geneva, Geneva, Switzerland

¹²Research Institute in Oncology and Hematology, CancerCare Manitoba, University of Manitoba, Winnipeg, Canada

¹³Medical Oncology Department, Hospital General Universitario Gregorio Marañón, Madrid, Spain

¹⁴Medical Oncology Unit, Royal North Shore Hospital, St Leonards, Australia

¹⁵Department of Oncology, University of Turin; Medical Oncology, Ordine Mauriziano Hospital, Torino, Italy

¹⁶Respiratory Department, Louis Pradel Hospital, Hospices Civils de Lyon Cancer Institute, Lyon, France

¹⁷Oncopharmacology Laboratory, Cancer Research Center of Lyon, Lyon, France

¹⁸Cancer Center, Kuopio University Hospital, Kuopio, Finland

¹⁹LKH Hochsteiermark Standort Leoben, Abteilung für Lungenkrankheiten, Leoben, Austria

²⁰Studiengesellschaft Hämato-Onkologie Hamburg, Hamburg, Germany

²¹Netherlands Cancer Institute, Amsterdam, The Netherlands

²²Medical Oncology Unit, University Clinic Golnik, Golnik, Slovenia

²³Department of Internal Medicine V, Hematology/Oncology, University Hospital Innsbruck, Innsbruck, Austria

²⁴Division of Thoracic Oncology, European Institute of Oncology IRCCS, Milan, Italy

²⁵Department of Medicine I, Comprehensive Cancer Center Vienna, Vienna, Austria

²⁶LKI Lungenfachklinik Immenhausen, Department of Thoracic Oncology, Immenhausen, Germany

²⁷R.S. McLaughlin Durham Regional Cancer Center at Lakeridge Health, Adjunct Assistant Professor Queen's University, Ontario, Canada

²⁸Department of Pneumology, Ordensklinikum Elisabethinen Linz, Linz, Austria

²⁹Dpt. Internal Medicine, St.Vinzenz Krankenhaus Betriebs GmbH, Zams, Austria

Introduction: RET gene fusions are rare genetic drivers in non-small cell lung cancer (NSCLC). Selective RET-inhibitors like selpercatinib have shown therapeutic activity in early clinical trials but their efficacy in the real-world setting is unknown.

Methods: A retrospective efficacy and safety analysis was performed on data from RET fusion-positive NSCLC patients who participated in a selpercatinib access program between August 2019 and January 2021. Twenty-seven centers in twelve different countries contributed to this dataset: Australia (1 center), Austria (8), Canada (2), Finland (1), France (2), Germany (4), Italy (2), Netherlands (2), Spain (1), Slovenia, (1), Sweden (2), and Switzerland (1).

Results: Data from 50 patients with RET fusion-positive advanced NSCLC treated with selpercatinib were analyzed. Most patients were Non-Asian (90 %), female (60 %), never smoker (74 %), with a median age of 65 years (range, 38–89) and 32 % had known brain metastasis at time of selpercatinib treatment. Overall, 13 patients were treatment-naïve, while 37 were pretreated with a median of 3 lines of therapy (range, 1–8). The objective response rate (ORR) was 68 % (95 % CI, 53–81) in the overall population. The disease control rate was 92 %. Median progression-free survival was 15.6 months (95 % CI, 8.8–22.4) after a median follow-up of 9 months. In patients with measurable brain metastases ($n=8$) intracranial ORR reached 100 %. In total, 88 % of patients experienced treatment-related adverse events (TRAEs), a large majority of them being grade 1/2; most

Fig. 1 | P07

common grade ≥ 3 TRAEs were increased liver enzyme levels (in 10 % of patients), prolonged QTc time (4 %), abdominal pain (4 %), hypertension (4 %) and fatigue/asthenia (4 %). None of patients discontinued selpercatinib treatment for safety reasons. No new safety concerns were observed, nor any treatment-related death.

Conclusions: In this real-world setting, the selective RET-inhibitor selpercatinib demonstrated durable systemic and intracranial antitumor activity in RET fusion-positive NSCLC and was well tolerated.

P08

Outpatient pulmonary rehabilitation in patients with long COVID improves exercise capacity, functional status, dyspnoea, fatigue, and quality of life

Stephan Nopp^{*1}, Florian Moik¹, Frederikus A. Klok², Dieline Gattringer³, Milos Petrovic³, Karin Vonbank¹, Andreas Koczulla⁴, Cihan Ay¹, Ralf Zwick³

¹Medical University of Vienna, Vienna, Austria

²Leiden University Medical Center, Leiden, The Netherlands

³Therme Wien Med, Vienna, Austria

⁴Philipps-University of Marburg, Marburg, Germany

Background: COVID-19 survivors face the risk of long-term sequelae including fatigue, breathlessness, and functional limitations. Pulmonary rehabilitation has been recommended, although formal studies quantifying the effect of rehabilitation in COVID-19 patients are lacking.

Methods: We conducted a prospective observational cohort study including consecutive patients admitted to an outpatient

pulmonary rehabilitation center due to persistent symptoms after COVID-19. The primary endpoint was change in 6-minute walk distance (6MWD) after undergoing a 6-week interdisciplinary individualized pulmonary rehabilitation program. Secondary endpoints included change in the post-COVID-19 functional status scale (PCFS), Borg dyspnea scale, Fatigue Assessment Scale and quality of life. Further, changes in pulmonary function tests were explored.

Results: Of 64 patients undergoing rehabilitation, 58 patients (mean age 47 years, 43 % women, 38 % severe/critical COVID-19) were included in the per-protocol-analysis. At baseline (i.e., in mean 4.4 months after infection onset), mean 6MWD was 584.1 m (± 95.0) and functional impairment was graded in median at 2 (IQR, 2–3) on the PCFS. On average, patients improved their 6MWD by 62.9 m (± 48.2 , $p < 0.001$) and reported an improvement of 1 grade on the PCFS scale. Accordingly, we observed significant improvements across secondary endpoints including presence of dyspnea ($p < 0.001$), fatigue ($p < 0.001$), and quality of life ($p < 0.001$). Also, pulmonary function parameters (FEV1, DLCO, inspiratory muscle pressure) significantly increased during rehabilitation.

Conclusion: Personalized interdisciplinary pulmonary rehabilitation improves exercise capacity, functional status, dyspnea, fatigue, and quality of life in patients with long COVID. Future studies are needed to establish the optimal protocol, duration, and long-term benefits as well as cost-effectiveness of rehabilitation.

P09

The impact of diagnostic delay on survival in alpha-1-antitrypsin deficiency – results from the Austrian Alpha-1 Lung Registry

Tobias Meischl^{*1,2}, Karin Schmid-Scherzer^{1,3}, Florian Vafai-Tabrizi^{1,3}, Gert Wurzing⁴, Eva Traunmüller-Wurm⁵, Kristina Kutics⁵, Markus Rauter⁶, Fikreta Grabcanovic-Musija⁷, Simona Müller⁸, Norbert Kaufmann⁹, Judith Löffler-Ragg¹⁰, Arschang Valipour^{1,11}, Georg-Christian Funk^{1,3}

¹Karl-Landsteiner-Institute for Lung Research and Pulmonary Oncology, Klinik Ottakring, Vienna, Austria

²Division of Gastroenterology und Hepatology, Department of Medicine III, Medical University of Vienna, Vienna, Austria

³Department of Medicine II with Pneumology, Klinik Ottakring, Vienna, Austria

⁴Center of Pulmology, LKH Graz II – Standort Enzenbach, Gratwein-Strassengel, Austria

⁵Department of Pulmology, Klinikum Wels-Grieskirchen, Wels, Austria

⁶Department of Pulmonology, Klinikum Klagenfurt am Woerthersee, Klagenfurt, Austria

⁷Department of Pneumology, Paracelsus Medical University, Salzburg, Austria

⁸Department of Pulmonology, Landeskrankenhaus Hohenems, Hohenems, Austria

⁹Division of Gastroenterology, Infectiology and Pneumology, Department of Medicine, LKH Graz II, Graz, Austria

¹⁰Department of Medicine II, Medical University of Innsbruck, Innsbruck, Austria

¹¹Department of Respiratory and Critical Care Medicine, Klinik Floridsdorf, Vienna, Austria

Background: Alpha-1-antitrypsin (AAT) deficiency (AATD) is a genetic disorder that can manifest as lung disease. A delay between onset of symptoms and diagnosis of AATD is common and associated with worse clinical status and more advanced disease stage but the influence on survival is unclear. We aimed to investigate the impact of diagnostic delay on overall survival (OS) and transplant-free survival (TS) in AATD patients.

Methods: We analysed 373 AATD patients from the Austrian Alpha-1 Lung (AAL) Registry. The AAL Registry is a prospective registry which includes AATD patients from nine specialized centres in Austria.

Results: The predominant phenotype was Pi*ZZ (79 %). At diagnosis, 84 % had an AAT level below 0.6 g/L. At inclusion, 34 % had never smoked, 60 % had quit smoking and 6 % continued to smoke. Lung disease was diagnosed in 75 %, thereof most patients were diagnosed with emphysema (49 %) and/or chronic obstructive pulmonary disease (33 %). Median diagnostic delay was 5.4 years. In multivariable analysis, a longer diagnostic delay was significantly associated with worse OS (hazard ratio [HR] 1.50; 95 % CI 1.04–2.17; $p=0.030$) and TS (HR 1.47; 95 % CI 1.11–1.94; $p=0.008$), independent from age, smoking status, body mass index (BMI) and forced expiratory volume in one second (FEV1). Furthermore, BMI, age and active smoking were significantly associated with worse OS as well as BMI and FEV1 were with worse TS.

Conclusions: A delayed diagnosis was associated with significantly worse OS and TS. Screening should be improved and efforts to ensure early AATD diagnosis should be intensified.

P10

Validation of the 2021 GLI reference equations for static lung volumes in a general European cohort

Tobias Mraz^{*1,2}, Marija Veselinovic², Alina Ofenheimer^{2,3,4}, Marie Kathrin Breyer^{1,2}, Sylvia Hartl^{1,2,3}, Otto Chris Burghuber^{1,2,3}, Brendan G. Cooper⁵, Angela Zacharasiewicz⁶, Bernd Lamprecht⁷, Sanja Stanojevic⁸, Robab Breyer-Kohansal^{1,2}

¹Department for Respiratory and Critical Care Medicine, Clinic Penzing, Vienna, Austria

²Ludwig Boltzmann Institute for Lung Health, Vienna, Austria

³Sigmund Freud University, Faculty of Medicine, Vienna, Austria

⁴NUTRIM, School of Nutrition and Translational Research in Metabolism, Maastricht University Medical Center, Maastricht, Netherlands

⁵University Hospitals Birmingham NHS Foundation Trust, Birmingham, England

⁶Department of Pediatrics, Clinic Ottakring, Vienna, Austria

⁷Department of Pulmonology, Kepler University Hospital, Linz, Austria

⁸Department of Community Health and Epidemiology, Dalhousie University, Halifax, Canada

Introduction: Reference equations (RefEq) are necessary to assess whether obtained lung volumes are in the range of normal and are required in the diagnosis of restrictive impairment. (TLC < LLN) Our aim was to identify if the recently published, all-age RefEq by the Global Lung Function Initiative (2021GLI) better reflect lung function within a European general population than previously used RefEq.

Methods: 4367 healthy, asymptomatic never-smokers (56 % female, aged 6–80 yrs) from the single-centered Austrian LEAD

	male (n=1919)			female (n=2448)		
	mean Z-score (±SD)	%>ULN	%<LLN	mean Z-score (±SD)	%>ULN	%<LLN
2021 GLI (5–80 years)						
TLC	0.38 ± 0.91	8.55	1.35	0.54 ± 0.85	9.93	0.41
RV	0.68 ± 0.81	7.35	0	0.84 ± 0.76	10.3	0.41
FRC	0.32 ± 0.87	6.36	1.72	0.45 ± 0.83	7.31	0.77
RV/TLC	0.65 ± 0.66	10.2	0	0.87 ± 0.95	12.5	0.41
IC	0.11 ± 1.02	7.35	1.67	1.36 ± 1.66	7.71	2.92
ERV	-0.25 ± 0.95	2.33	7.72	-1.30 ± 2.00	1.46	8.18
1993 ECSC (18–70 years)						
TLC	0.45 ± 1.36	18.5	5.25	1.20 ± 1.30	35.8	1.12
RV	0.55 ± 1.16	16.9	1.3	0.97 ± 1.29	26.4	0.92
FRC	1.48 ± 3.57	45.9	19.4	2.04 ± 3.61	52.9	14.7
RV/TLC	-0.06 ± 0.69	1.8	0.14	0.11 ± 0.76	3.61	0.56
Zapletal (6–18 years)						
TLC	0.21 ± 0.43	0.38	0	0.19 ± 0.46	0.83	0
RV	1.18 ± 1.41	29.9	0.38	0.86 ± 1.23	24.3	1.04
FRC	0.29 ± 0.61	3.21	0	0.46 ± 0.66	5.19	0
RV/TLC	2.63 ± 3.96	55.3	12.9	4.20 ± 5.13	67.9	10.8

Abbreviations: GLI=Global Lung Function Initiative, ECSC=European Coal and Steel Society, SD=standard deviation; ULN=upper limit of normal; LLN=lower limit of normal; TLC=total lung capacity, RV=residual volume, FRC=functional residual capacity, IC=inspiratory capacity, ERV=expiratory reserve volume

Fig. 1 | P10 Mean Z-scores and distribution above ULN and under LLN for different reference equations

study with body box testing (JAEGGER; BT-MasterScopeBody©) were analysed. Mean z-scores were calculated by using the 2021GLI and the 1993ECSC (>18 years) and 1977Zapletal RefEq (<18 years). Distribution of z-scores and the %< lower limit of normal (LLN) and %>upper limit of normal (ULN) were analysed.

Results: The 2021GLI RefEq demonstrated a better fit for lung volumes compared to the previous RefEq in terms of distribution of the expected 5 %< LLN and %>ULN in a healthy population (Table1). However, TLC< LLN by 2021GLI was lower than expected for males (1,4 %) and females (0,4 %). This was also found for residual volume; functional residual capacity and inspiratory capacity.

Conclusion: The 2021GLI RefEq showed better fit for static lung volumes compared to previous RefEq in a European population. However, 2021GLI may underestimate the prevalence of restrictive impairment.

P11

Individualised Skin Prick Tests (SPTs) to Evaluate Sensitisations against Colonising Fungal Species in Patients with Cystic Fibrosis (CF)

Sara Zanella^{*1,2}, Volker Strenger¹, Buzina Walter³, Sophie Kienreich³, Egger Markus¹, Andreas Pfleger¹, Ernst Eber¹

¹Division of Paediatric Pulmonology and Allergology, Department of Paediatrics and Adolescent Medicine, Medical University Graz, Graz, Austria

²Department of Women's and Children's Health, University of Padova, Padova, Italy

³Institute of Hygiene, Microbiology and Environmental Medicine, Medical University Graz, Graz, Austria

Introduction: Lung function deterioration in CF patients may be caused by allergic bronchopulmonary aspergillosis (ABPA) or mycosis (ABPM). The lack of SPT extracts or specific IgE tests against most fungi possibly leads to an underestimation of ABPM.

The aim was to investigate if CF patients are sensitised against fungal species colonising their airways and if a sensitisation is detectable via SPTs using individually produced extracts.

Methods: In this prospective study, individually produced extracts from colonising fungi, as well as *Aspergillus fumigatus* and *Candida albicans* commercial extracts were used to perform SPTs.

The patients' clinical state, lung function, eosinophil count, total and specific IgE against *A. fumigatus* and *C. albicans* were analysed.

Results: Out of 111 CF patients, 44 (39.6 %) were colonised with fungi in relevant amounts and were tested with individually produced extracts of 20 colonising fungal species.

The SPTs of 16/44 patients (36.4 %) resulted positive: 4 were positive to individually produced extracts, 3 of them to individually produced and commercial extracts of *A. fumigatus*. The fourth patient was positive to individually produced and commercial extracts of *C. albicans*, and an individually produced extract of *A. fumigatus* "non-sporulating" subtype, but negative to *A. fumigatus* "sporulating" subtype and commercial extract. Twelve patients were positive to commercial extracts (10 to *A. fumigatus*, 2 to *C. albicans*) but were not colonised and therefore not tested with individually produced extracts.

Only in 1/28 cases (3.6 %) a discordant result was observed between commercial and individually produced extracts. No patient had ABPM.

Conclusion: No sensitisation to other fungi than *A. fumigatus* or *C. albicans* was found. This may be due to other fungi not inducing sensitisation or due to the low number of colonised patients. The employed method appears to be reliable but further studies are needed.

P12

qSOFA score poorly predicts critical progression in COVID-19 patients

Sven Heldt^{*1}, Matthias Neuböck¹, Nora Kainzbauer¹, Guangyu Shao¹, Thomas Tschoellitsch², Martin Duenser², Bernhard Kaiser¹, Markus Winkler³, Christian Paar⁴, Jens Meier², Bernd Lamprecht¹, Helmut J.F. Salzer¹

¹Department of Pulmonary Medicine, Kepler University Hospital, Linz, Austria

²Department of Anesthesiology and Intensive Care Medicine, Kepler University Hospital, Linz, Austria

³Department of Pathology and Microbiology, Kepler University Hospital, Linz, Austria

⁴Institute of Laboratory Medicine, Kepler University Hospital, Linz, Austria

Introduction: In December 2019, the new virus infection coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged. Simple clinical risk scores may improve the management of COVID-19 patients. Therefore, the aim of this pilot study was to evaluate the qSOFA score as an early risk assessment tool predicting a severe course of COVID-19.

Methods: We retrospectively analyzed data from adult COVID-19 patients hospitalized between March and July 2020. A critical disease progress was defined as admission to intensive care unit (ICU) or death.

Results: Of 64 COVID-19 patients 33 % (21/64) had a critical disease progression from which 13 patients had to be transferred to ICU. COVID-19 associated mortality rate was 20 %, increasing to 39 % after ICU admission. All patients without a critical progress had a qSOFA score ≤1 at admission. Patients with a critical progress had in only 14 % (3/21) and in 20 % (3/15) of cases a qSOFA score ≥2 at admission ($p=0.023$) or when measured directly before critical progression, respectively, while 95 % (20/21) of patients with critical progress had an impairment

Fig. 1 | P12

oxygen saturation (SO₂) at admission time requiring oxygen supplementation.

Conclusion: A low qSOFA score cannot be used to assume short-term stable or noncritical disease status in COVID-19.

P13

Outpatient pulmonary rehabilitation for patients with lung cancer: a retrospective real-world data analysis

Oliver Illini^{*1,2}, Dietlinde Gattinger³, Milos Petrovic³, Arschang Valipour^{1,2}, Ralf Harun Zwick³

¹Karl Landsteiner Institute of Lung Research and Pulmonary Oncology, Vienna, Austria

²Department of Respiratory and Critical Care Medicine, Klinik Floridsdorf, Vienna, Austria

³Outpatient Pulmonary Rehabilitation, Therme Wien Med, Vienna, Austria

Introduction: Patients with lung cancer frequently suffer from physical deconditioning, low exercise capacity and reduced quality of life. There is little evidence on the effects of a structured outpatient pulmonary rehabilitation program (OPR) on exercise capacity, exercise endurance, and symptom load.

Methods: This is a retrospective, single-center, real world data analysis of lung cancer patients, who were referred to OPR. Patients underwent a multiprofessional and individualized 6 weeks OPR. Primary endpoint was a statistically significant change in the six-minute walking test distance (6-MWT). Secondary endpoints included maximal workload and constant work rate test results during cycle-ergometry, changes of the upper and lower extremity strength, and inspiratory muscle strength. The COPD Assessment Test (CAT) was used to investigate the symptom burden.

Results: Fifty-nine patients with lung cancer (83 % with non-small cell lung cancer) were referred to OPR. Of those 54 (92 %) completed the full six-weeks of OPR. Four patients (7 %) stopped OPR for medical reasons. Median age was 57 years [95 % confidence interval (CI), 54.3–59.3] and 59 % were female. Thirty patients were in tumor stage I, 4 in II, and 13 in III, respectively (7 unknown). Prior to OPR all patients underwent surgery with curative intent, and 51 % also received chemotherapy. At completion, patients showed a statistically significant increase in 6-MWT with a mean difference of 49 meters (95 % CI, 28.9–69.2; $p<0.001$). Of those 75 % improved >30,5 meters. Significant improvements were also seen in all other exercise and strengths tests ($p<0.001$). Improvements in functional outcomes were

Assessment	Available data / total number of patients	Admission Mean (SD)	Discharge Mean (SD)	Difference	MCID	P - value
6-MWT (m)	45 / 54	474.3 (93.8)	523.4 (90.5)	+49.1 (10.4%)	60%	<0.001
Wmax (watt)	45 / 54	100.1 (29.8)	114.1 (32.9)	+14.0 (14.0%)	73%	<0.001
CWR70% (min)	42 / 54	9.9 (7.9)	14.1 (8.8)	+4.2 (42.4%)	60%	<0.001
CAT (score)	26 / 54	14.4 (7.5)	11.3 (7.2)	-3.1 (21.5%)	73%	0.001

MCID = minimal clinical important difference; 6-MWT = 6-minute walking test, MCID = +25m; Wmax = maximal work load on cycle ergometer, MCID = +4; CWR70% = constant work rate test at 70% of Wmax, MCID = +2; CAT = COPD Assessment Test, MCID = 2.

Fig. 1 | P13 Exercise and dyspnea assessment at admission and discharge of outpatient pulmonary rehabilitation

accompanied by a significant reduction of the CAT score (mean difference -3.1, $p=0.001$). No adverse effects were reported.

Conclusions: OPR for lung cancer patients is safe, effective and with high adherence. Patients with lung cancer demonstrated improvements in exercise capacity and parameters of muscle strengths, as well as a reduction in symptom burden following OPR.

P14

Seroprevalence of Aspergillus-specific IgG antibody among Mozambican tuberculosis patients

Helmut Salzer^{*1}, Isabel Massango², Nilesh Bhatt², Emelva Machonisse², Maja Reimann^{3,4}, Sven Heldt¹, Christoph Lange^{3,4,5,6}, Michael Hoelscher^{7,8}, Celso Khosa^{2,9}, Andrea Rachow^{7,8,9}

¹Kepler Universitätsklinikum, Abteilung für Pneumologie, Linz, Österreich, Linz, Austria

²Instituto Nacional de Saúde, Marracuene, Mozambique

³Division of Clinical Infectious Diseases, Research Center Borstel, Borstel, Germany

⁴German Center for Infection Research (DZIF), partner site Hamburg-Lübeck-Borstel-Riems, Borstel, Germany

⁵Respiratory Medicine & International Health, University of Lübeck, Lübeck, Germany

⁶Baylor College of Medicine and Texas Children's Hospital, Houston, USA

⁷Division of Infectious Diseases and Tropical Medicine, University Hospital, Munich, Germany

⁸German Center for Infection Research (DZIF), partner site Munich, Munich, Germany

⁹Center for International Health-CIH LMU, Munich, Germany

Introduction: Chronic pulmonary aspergillosis (CPA) is a life-threatening sequel in patients with pulmonary tuberculosis (PTB). Aspergillus-specific IgG antibody is a useful diagnostic biomarker supporting CPA diagnosis, especially in countries with limited health resources.

Methods: We conducted a prospective pilot study to assess the seroprevalence of Aspergillus-specific IgG antibody among 61 Mozambican tuberculosis patients before, during and after end of TB treatment. Aspergillus-specific IgG antibody levels were measured using the ImmunoCAP®.

Results: Three out of 21 HIV-negative PTB patients had a positive Aspergillus-specific IgG antibody level before, during and after end of TB treatment. Antibody levels were 41.1, 45.5

Fig. 1 | P14

and 174 mg/l at end of treatment (EOT), respectively. Additionally, two HIV-negative PTB patients with negative Aspergillus-specific IgG antibody levels at baseline became sero-positive at EOT (41.9 and 158 mg/l, respectively). Interestingly, none of the HIV-positive PTB patients (40/61) had a positive Aspergillus-specific IgG antibody level at any time neither at baseline nor at EOT. Probable CPA was diagnosed in one HIV-negative patient (5%; 1/20).

Conclusion: Seroprevalence of Aspergillus-specific IgG antibody considerably differed between HIV-negative and HIV-positive Mozambican PTB patients. Future studies evaluating post-tuberculosis lung disease should integrate CPA as a life-threatening sequel to PTB.

P15

Prognostic Implications of Baseline Quantitative PET/CT Biomarkers in First-Line Immunotherapy of Non-Small Cell Lung Cancer

David Lang^{*1}, Linda Ritzberger², Vanessa Rambousek¹, Andreas Horner¹, Romana Wass¹, Bernhard Kaiser¹, Bernd Lamprecht¹, Michael Gabriel³

¹Johannes Kepler University Hospital, Department of Pulmonology, Linz, Austria

²Johannes Kepler University, Medical Faculty, Linz, Austria

³Johannes Kepler University Hospital, Institute of Nuclear Medicine and Endocrinology, Linz, Austria

Background: Various quantitative biomarkers derived from positron-emission tomography/computed tomography (PET/CT) such as total metabolic tumor volume (TMTV) or total lesion glycolysis (TLG) have been suggested as prognostic variables in non-small cell lung cancer (NSCLC) patients treated with immune-checkpoint inhibitors (ICI). However, most evidence is currently based on small patient cohorts treated with different ICI in various therapy lines.

Methods: We retrospectively identified 85 patients having undergone 18F-FDG-PET/CT for staging of advanced NSCLC, who subsequently received first-line immunotherapy with pembrolizumab, either in combination with platinum-based doublet chemotherapy ($n=70$) or as monotherapy ($n=15$). Quantitative PET/CT biomarkers maximum and mean standardized uptake value (SUVmax/mean), TMTV, TLG, total lesion uptake, total lesion quotient, bone-to-liver and spleen-to-liver ratio (BLR/SLR) were calculated using HERMES imaging soft-

ware (Hermes medical solutions, Stockholm, Sweden). Progression-free and overall survival (PFS/OS) were calculated using Kaplan-Meier analyses, maximally selected rank (MSR) statistics were used to determine cut-off values of PET/CT-derived biomarkers. Their interaction with PFS and OS was analyzed using Cox-regression models.

Results: Among all patients, PFS was 5 (4,8) months (M) and OS was 14M (7,18). Multivariate selection for both PFS and OS revealed TMTV as the most relevant PET/CT biomarker ($p < 0.001$). Median PFS and OS were significantly longer in patients with $TMTV \leq 70\text{mL}$ (10M (4,16) and not reached) than for $TMTV > 70\text{mL}$ (4M (3, 5) and 10M (5, 15)), respectively. Of interest, BLR with a cut-off at 1.06 provided PFS and OS results similar to MTV. In the subgroup of patients with $TMTV > 70\text{mL}$, a concomitant $BLR \leq 1.06$ identified subjects with a more favorable prognosis.

Conclusion: Metabolically active tumor burden as measured by TMTV combined with BLR has major prognostic implications in first-line ICI treated patients.

P16

Real-Life Benefit of First-Line Pembrolizumab Therapy for Advanced NSCLC – a Propensity-Score Matched Case-Control Study

Vanessa Rambousek^{*1}, Lea Friedrich², David Lang¹, Andreas Horner¹, Bernhard Kaiser¹, Bernd Lamprecht¹

¹Johannes Kepler University Hospital Linz, Department of Pulmonology, Linz, Austria

²Johannes Kepler University Linz, Medical Faculty, Linz, Austria

Background: Immunotherapy using immune-checkpoint inhibitors (ICI) has revolutionized the treatment of non-small cell lung cancer (NSCLC) but constitutes a considerable financial burden on health care systems. We aimed to estimate the real-life benefit of first-line immunotherapy by comparing an ICI-treated cohort with a matched historical chemotherapy cohort.

Methods: Ninety-three patients having received first-line immunotherapy with pembrolizumab for advanced NSCLC as monotherapy in patients with a programmed death-ligand 1-expression of $\geq 50\%$ on tumor cells or as combination therapy together with platinum-based doublet chemotherapy were retrospectively identified. Using propensity-score matching for age, sex, Eastern Cooperative Oncology Group (ECOG) performance status and histological subtype, the ICI-treated cohort was compared to a historical first-line chemotherapy cohort treated between 2011 and 2016 that was retrieved from the institutional lung cancer registry. Patients in that cohort who had subsequently received ICI in later therapy lines were excluded. For both groups, progression-free (PFS) and overall survival (OS) were calculated using Kaplan-Meier analyses, the log-rank test was used for statistical comparison between the groups.

Results: The ICI-treated cohort did not differ significantly from the historical control group in terms of the matching criteria (male sex 60 vs. 68 %, mean age 65.3 (8.7) vs. 64.6 (9.9) years, ECOG 0/1 81.7 vs. 73.1 %, adenocarcinoma 73.1 vs. 74.2 %). Progression-free survival was significantly ($p < 0.001$) longer in the immunotherapy cohort (6M (4, 9) vs. 4M (3,5)) and so was overall survival (14M (8, 19) vs. 8M (7, 10); $p = 0.01$).

Conclusion: Immune-checkpoint inhibitor therapy has significantly improved the prognosis of patients receiving first-line treatment of advanced NSCLC.

P17

I Non-small cell lung cancer in young patients: clinical, molecular, immunopathological status and survival time

Irina Robinson^{*}, Horst Olschewski, Robert Wurm

Clinical Department of Internal Medicine, Division of Pulmonology, Medical University of Graz, Graz, Austria

Background and aim: Non-small cell lung cancer (NSCLC) is a common cancer with increasing incidence worldwide. Usually, NSCLC is diagnosed between 60–75 yrs of age. NSCLC at a young age < 50 yrs is uncommon, but the rate has been increasing in the last years. The aim of this study was to analyze the clinical, molecular and immunopathological characteristics of NSCLC in patients < 50 yrs and to compare their survival time with the average NSCLC population.

Methods: We retrospectively analyzed NSCLC patients < 50 yrs at diagnosis treated in our division between 2015 and 2021. We used the Cox-Regression method and an open-access online calculator.

Results: We included 35 patients (female 51 %, male 49 %) with an age of 45 ± 5 yr. The most common histological type was adenocarcinoma (91 %). NSCLC was discovered at stage IV in 71 % of cases. 92 % of patients are/were active smokers. In 40 %, no targetable mutations were detected and tumor tissue was PD L1 negative. The most frequent mutation was ALK in 20 % of cases and a PD L1 expression $\geq 50\%$ was observed in 17 % of patients. In the general NSCLC population these numbers were approximately 5 % and 30 %, respectively. The median follow-up was 12 months. The 6-month and 12-month survival were 63 % and 42 %. The 12-month survival in our ALK positive patients with NSCLC in stage IV who received targeted therapy was 71 %, but the 12-month survival in a general NSCLC population in stage IV is approximately 10 %.

Conclusion: Despite diagnostic and therapeutic progress, survival in young individuals with NSCLC is still poor and most patients are diagnosed at a very late stage. ALK mutation appears to be more frequent than in the general NSCLC population.

P18

I DHEA and GDF-15 are promising markers for follow-up in patients with pulmonary arterial hypertension

Vasile Foris^{*}, Ceren Ayse Mutgan, Andrea Borenich, Gabor Kovacs, Philipp Douschan, Teresa Sassmann, Katarina Zeder, Andrea Olschewski, Grazyna Kwapiszewska, Horst Olschewski

Medical University of Graz, Graz, Austria

Introduction: Development of standardized predictive blood-derived biomarkers in pulmonary arterial hypertension (PAH) would help to guide therapy decisions for targeted PAH therapies. We aimed to analyse predefined longitudinal plasma biomarker levels during long-term treatment of PAH for treatment response and survival.

Methods: Plasma levels of growth differentiation factor-15 (GDF-15), dehydroepiandrosteron (DHEA), osteopontin and endostatin were assessed in PAH patients who underwent serial

right heart catheterizations for clinical follow-up in our center between 2011 and 2019. Association with hemodynamics and survival was investigated by univariate Cox regression analysis. Correlations between biomarkers and hemodynamics were determined using Spearman's correlation coefficient.

Results: $N=39$ ($n=21$ incident and $n=18$ prevalent) patients were included (m:f=15:24, mPAP=45 mmHg, IQR:35.5–53.5). Median follow-up time was 42 months (IQR: 35.5–63.5). From baseline to follow-up there was a significant decrease of PVR from 8.4 WU (IQR: 6.4–11.2) to 5.5 WU (3.4–9.7). Only DHEA changed significantly from baseline to follow-up (9.9 pg/mL (IQR:5.5–18.7) vs 5.8 pg/mL (IQR:3.8–14.7), $p=0.02$). Changes in DHEA and changes in RAP were correlated ($r=-0.40$, $p<0.05$). There are no other correlation between changes of biomarker and hemodynamic changes. Baseline GDF-15 was significantly correlated with baseline cardiac index ($r=-0.35$, $p<0.05$) and values above median were associated with poor survival (HR=5.14 (1.98–13.33), ($p=0.001$). Follow-up GDF-15 was also significantly associated with survival (HR=4.27 (1.73–10.58), $p=0.002$), whereas the change from baseline to follow-up in GDF-15, DHEA, osteopontin and endostatin were not.

Conclusion: In PAH patients, among the investigated markers, GDF-15 may serve as a prognostic biomarker both at baseline and during follow-up but prediction of hemodynamic responses to PAH therapy was poor among all investigated markers.

P19

No evidence of diabetes-related alterations in pulmonary hemodynamics during exercise in patients with suspected pulmonary hypertension and/or unexplained exertional dyspnea

Antti-Pekka Rissanen^{*1}, Katarina Zeder^{1,2}, Horst Olschewski^{1,2}, Gabor Kovacs^{1,2}

¹Ludwig Boltzmann Institute for Lung Vascular Research, Graz, Austria

²Division of Pulmonology, Department of Internal Medicine, Medical University of Graz, Graz, Austria

Introduction: Occasional findings based on non-invasive methodology have suggested that diabetes might impair functional reserves of the pulmonary circulation. We examined if invasively measured pulmonary hemodynamics during exercise differ between patients with and without diabetes (DM) in a real-life patient cohort.

Methods: In this single-center retrospective case-control study, we identified all patients with DM and resting mean pulmonary artery pressure (mPAP) <25 mmHg who underwent symptom-limited exercise right heart catheterization (RHC) due to suspected pulmonary hypertension and/or unexplained exertional dyspnea between June 2005 and April 2021. For each DM patient, we identified three control patients without DM, using age (tolerance: ± 5 yrs), sex, resting mPAP (± 1 mmHg), and body position during exercise RHC as matching criteria. Exercise hemodynamics were compared between the groups with mPAP/cardiac output (mPAP/CO), pulmonary artery wedge pressure/CO (PAWP/CO), and transpulmonary gradient/CO (TPG/CO) slopes as main outcomes.

Results: Twenty-two patients with DM (age: 67 ± 9 yrs, 64 % female, resting mPAP: 19 ± 2 mmHg) and 66 patients without DM (no-DM; 67 ± 8 yrs, 64 %, 20 ± 3 mmHg) were

included. Comorbidity scores, anthropometrics, pulmonary function, and resting hemodynamics did not differ between the groups (all $p>0.092$). During RHC, exercise pulmonary hypertension was equally prevalent (76 vs. 90 %, $p=0.142$), and mPAP/CO (median 5.0 [interquartile range 3.7–9.3] vs. 5.6 [3.7–9.4] mmHg/l/min, $p=0.478$), PAWP/CO (3.0 [1.7–4.2] vs. 3.0 [1.4–6.9] mmHg/l/min, $p=0.813$), or TPG/CO (2.1 [1.3–4.3] vs. 2.0 [1.0–3.8] mmHg/l/min, $p=0.834$) slopes did not differ between DM vs. no-DM, respectively. Further, no group effects, group $\times$ exercise interactions, or between-group differences in peak exercise values were observed for any hemodynamic variables (all $p>0.088$).

Conclusions: Most patients of this cohort demonstrated abnormal pulmonary hemodynamics during exercise. However, resting and exercise pulmonary hemodynamics did not differ between DM and no-DM patients. This does not support diabetes to be a clinically relevant modifier of the functional reserves of the pulmonary circulation.

P20

18F-FDG-PET/CT as a clinical parameter at the end of treatment in patients with drug-sensitive pulmonary tuberculosis

Matthias Neuböck^{*1}, Bernhard Wageneder¹, David Lang¹, Helmut Huber², Guangyu Shao¹, Sven Heldt¹, Michael Mandl¹, Christian Paar³, Markus Winkler⁴, Franz A. Fellner^{5,6}, Michael Gabriel^{2,6}, Bernd Lamprecht^{1,6}, Helmut J.F. Salzer¹

¹Kepler Universitätsklinikum, Abteilung für Pneumologie, Linz, Österreich, Linz, Österreich

²Kepler Universitätsklinikum, Institut für Nuklearmedizin und Endokrinologie, Linz, Österreich

³Kepler Universitätsklinikum, Institut für Labormedizin, Linz, Österreich

⁴Kepler Universitätsklinikum, Institut für Pathologie und Mikrobiologie, Linz, Österreich

⁵Kepler Universitätsklinikum, Institut für Radiologie, Linz, Österreich

⁶Johannes Kepler Universität, Medizinische Fakultät, Linz, Österreich

Introduction: Optimal treatment duration for drug-sensitive pulmonary tuberculosis (DS-PTB) is unknown. We assessed the clinical value of the 18F-fluorodeoxyglucose positron emission tomography-computed tomography (18F-FDG PET/CT) scan as a radiological biomarker to predict the risk of relapse in patients with DS-PTB at the end of treatment (EOT).

Methods: We retrospectively analysed DS-PTB patients having at least one 18F-FDG PET/CT scan between 2011 and 2019. DS-PTB patients with and without residual metabolic activity (RMA) at the EOT were compared.

Results: Out of 236 patients screened, 35 DS-PTB patients had at least one 18F-FDG PET/CT scan at EOT. Sixty-three per cent (22/35) of DS-PTB patients had a RMA at EOT, while 37 % (13/35) showed a complete metabolic response (CMR). None of the DS-PTB patients developed a relapse during follow-up neither in the RMA- nor in the CMR group. Median follow-up period was 14 months (IQR 2–94) in the RMA group and 12 months (IQR 6–74) in the CMR group.

Conclusions: RMA in the 18F-FDG PET/CT at the EOT in patients with DS-PTB was not associated with a higher risk of tuberculosis relapse during follow-up.

Fig. 1 | P20

P21

Prevalence of restrictive lung function and clinical characteristics in a general population: the LEAD (Lung, hEart, sociAl, boDy) study

Caspar Schiffrers^{*1}, Emiel Wouters^{1,2}, Marie-Kathrin Breyer^{1,3}, Marija Veselinovic¹, Tobias Mraz^{1,3}, Gabriele Kohlböck¹, Otto Burghuber^{1,4}, Sylvia Hartl^{1,3,4}, Bernd Lamprecht⁵, Robab Breyer-Kohansal^{1,3}

¹Ludwig Boltzmann Institute: The Lead Study, Vienna, Austria

²NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University, Medical Center, Maastricht, The Netherlands

³Department of Respiratory and Pulmonary Diseases, Clinic Penzing, Vienna, Austria

⁴Sigmund Freud University, Faculty of Medicine, Vienna, Austria

⁵Department of Pulmonology and Faculty of Medicine, Kepler University Hospital, Linz, Austria

Restrictive lung function (RLF) is characterized by a reduced lung expansion and/or size. Accurate diagnosis of RLF requires examination of total lung capacity (TLC) by body plethysmography. Indirect assessment of restriction is performed by spirometry (restrictive spirometric pattern; RSP). Prevalence data on RLF by body plethysmography are scarce for the general population, and the prevalence of RSP varies widely. The current study therefore evaluated the prevalence of RLF in the general population by body plethysmography. We examined 9147 subjects (47.5 % male; 6–82 years) with valid lung function measurements in the Austrian LEAD Study, a single-centered, longitudinal, population-based cohort. The following groups were defined 1) normal lung function, 2) RLF, 3) RSP, 4) RLFERS/ATS, or 5) RSP only. The overall prevalence of RLF and RSP in the general population was 5.5 % (5.7 % male, 5.4 % female) and 4.1 % (4.8 % male, 3.4 % female), respectively. In the age groups 6–<20, 20–<40, 40–<60, ≥60 years, the prevalence of RLF was 5.7 % (6.2 % male, 5.2 % female), 5.5 % (6.0 % male, 4.9 % female), 4.6 % (4.1 % male, 5.0 % female) and 6.8 % (7.3 % male, 6.4 % female), respectively. Furthermore, RSP is associated with changes in the forced expiratory ventilation but not with lung volumes reductions (TLC, RV, FRC), highlighting that RSP and FVC are not a proxy for restriction.

Fig. 1 | P21

P22

Standard-of-Care Asthma Controller Regimen Reduction with Benralizumab Treatment: ANDHI in Practice Study

Renaud Louis¹, Pascal Chanez², Francesco Menzella³, George Philteos⁴, Borja G Cosio⁵, Njira L. Lugogo⁶, Gustavo de Luiz⁷, Tim Harrison^{8,9}, Annie Burden¹⁰, Timothy Adlington¹⁰, Nanna Keeling¹¹, Justin Kwiatek¹², Esther Garcia Gil¹³

¹University and CHU of Liège, Liège, Belgium

²Department of Respiratory CIC Nord INSERM INRAE C2VN, Aix Marseille University, Marseille, France

³Pneumology Unit, Santa Maria Nuova Hospital, Azienda USL di Reggio Emilia-IRCCS, Reggio Emilia, Italy

⁴Royal University Hospital, University of Saskatchewan, Canada

⁵Hospital Son Espases-IdISBa and Ciberes, Palma de Mallorca, Spain

⁶University of Michigan, Ann Arbor, USA

⁷Hospital Vithas Xanit Internacional, Christian Domingo Ribas: Universitat Autònoma de Barcelona, Barcelona, Spain

⁸Nottingham Respiratory NIHR BRC, University of Nottingham, UK

⁹BioPharmaceuticals R&D Digital, AstraZeneca, Cambridge, UK

¹⁰BioPharmaceuticals R&D, Late Respiratory & Immunology, Biometrics, AstraZeneca, Cambridge, UK

¹¹BioPharmaceuticals Medical/Evidence, AstraZeneca, Gothenburg, Sweden

¹²BioPharmaceuticals Medical, AstraZeneca, Wilmington, USA

¹³Global Medical Respiratory, BioPharmaceuticals Medical, AstraZeneca, Barcelona, Spain

Rationale: To assess the potential to reduce standard-of-care asthma controller medication while maintaining asthma control with benralizumab.

Methods: At the completion of the 24-week, double-blind, randomized, placebo-controlled phase 3b ANDHI study, eligible adults with severe, eosinophilic asthma (SEA) were enrolled in the 56-week, ANDHI in Practice open-label extension. Concomitant asthma therapies were tapered for patients achieving and maintaining sufficient asthma control with benralizumab (Asthma Control Questionnaire-6 [ACQ-6] <1.5, no increase in ACQ-6 ≥ 0.5, and exacerbation-free). After an 8-week run-in, there were 5 visits every 8 weeks to potentially reduce background medication. Main outcome measures (summarized descriptively) were the proportion of patients with reductions in one or more asthma medications and achieving increasing numbers of GINA step reductions at end of trial (EOT) for non-OCS dependent patients. Percentage reductions in daily OCS dosage was the main measure for OCS-dependent patients.

Results: A total of 53.3 % ($n = 208/390$) of non-OCS dependent patients treated with benralizumab successfully achieved ≥1 background medication reductions. In those patients with asthma control at EOT ($n = 179$), 72.6 % ($n = 130$) achieved background therapy reductions. 42 % ($n = 163$) of patients achieved ≥1 GINA step reductions from baseline to EOT, increasing to 62 % ($n = 110$) in patients with asthma control at EOT. In the OCS dependent group, 51 % ($n = 50/99$) eliminated OCS use by EOT.

Conclusions: Patients with SEA treated with benralizumab successfully had reductions in both OCS and non-OCS background therapies as well as GINA step reductions.

P23

I The effect of tezepelumab in patients with allergic and non-allergic asthma: results from the NAVIGATOR phase 3 study

Jonathan Corren¹, Andrew Menzies-Gow², Christopher S Ambrose³, Bill Cook³, Kamil Kmita⁴, Gene Colice⁵, Jean-Pierre Llanos-Ackert⁶

¹David Geffen School of Medicine, University of California, Los Angeles (UCLA), Los Angeles, USA

²Royal Brompton Hospital, London, UK

³Respiratory and Immunology, BioPharmaceuticals Medical, AstraZeneca, Gaithersburg, USA

⁴Biometrics, Late-stage Development, Respiratory and Immunology, BioPharmaceuticals R&D, AstraZeneca, Warsaw, Poland

⁵Late-stage Development, Respiratory and Immunology, BioPharmaceuticals R&D, AstraZeneca, Gaithersburg, USA

⁶Global Medical Affairs, Amgen, Thousand Oaks, USA

Background: Tezepelumab is an anti-thymic stromal lymphopoietin human monoclonal antibody. The phase 3 NAVIGATOR study (NCT03347279) investigated the efficacy and safety of tezepelumab in patients with severe, uncontrolled asthma. This prespecified exploratory analysis evaluated the efficacy of tezepelumab in subgroups of NAVIGATOR patients according to omalizumab (OMA) treatment eligibility (EU prescribing information).

Methods: NAVIGATOR was a multicentre, randomized, double-blind, placebo-controlled study. Patients (12–80 years old) receiving medium- or high-dose inhaled corticosteroids (ICS) and ≥1 additional controller medication with or without oral corticosteroids, were randomized 1:1 to receive tezepelumab 210 mg or placebo subcutaneously every 4 weeks for 52 weeks. The annualized asthma exacerbation rate (AAER) over 52 weeks was assessed in OMA-eligible and OMA-ineligible patients. OMA-eligible patients (defined as having allergic asthma) were receiving high-dose ICS and had a positive fluorescence enzyme immunoassay test for perennial aeroallergens; a baseline serum total immunoglobulin (IgE) level ≥ 30 to ≤ 1500 IU/mL; a baseline body weight ≥ 20 to ≤ 150 kg; and an IgE-body weight combination within the range in the OMA EU prescribing information.

Results: Overall, 1059 patients received either tezepelumab 210 mg ($n = 528$) or placebo ($n = 531$), of which 359 and 695 patients were OMA-eligible and OMA-ineligible, respectively (5 unknown). In the placebo group, the AAER over 52 weeks was higher in OMA-eligible patients than OMA-ineligible patients. Tezepelumab reduced the AAER over 52 weeks versus placebo by 67 % (95 % CI: 54–76) and 48 % (95 % CI: 35–59) in OMA-eligible and OMA-ineligible patients, respectively.

Conclusions: Tezepelumab reduced exacerbations versus placebo in patients with allergic and non-allergic asthma, further supporting its potential benefits in a broad population of patients with severe, uncontrolled asthma. The AAER reduction with tezepelumab in OMA-eligible patients appears to compare favourably with that reported with OMA in randomized, placebo-controlled studies of patients with severe asthma.

P24

I Principles and approvals of tests for diagnostics of COVID-19 disease

Rüdiger Siekmeier^{*1}, Tanja Grammer², Winfried März³

¹Drug Regulatory Affairs, Pharmaceutical Institute, University Bonn, Bonn, Germany

²Medical Clinic V, Mannheim Medical Faculty, University of Heidelberg, Mannheim, Germany

³Synlab Academy, Synlab Holding Deutschland GmbH, Mannheim, Germany

In December 2019 a new disease was described in Wuhan/China. It was identified as a novel coronavirus infection by the Chinese Center for Disease Control and prevention (CCDC) on Jan. 7th 2020 and announced as 2019-new coronavirus disease (2019-nCoV, now COVID-19) by the World Health Organization (WHO) on Feb. 11th 2020. The pandemic rapidly spread across the globe and at July 26th 2021 at least 194.2 million infections and 3.85 million deaths were reported worldwide (<https://coronavirus.jhu.edu/map.html>). Rapidly tests for disease diagnostics were developed. Several lists provide available tests, manufacturers and additional information (e.g. analytical principle, regulatory status, instruction for use, sensitivity, specificity). PCR (reference method) and serological assays (laboratory methods,

rapid tests (lateral flow assay (LFA)) were firstly introduced into the market, antigen tests especially LFA for professional or lay use latest. The list <https://www.360dx.com/coronavirus-test-tracker-launched-covid-19-tests> provides 599 products (July 21st 2021), of these 343 PCR tests, 20 isothermal amplification tests, 8 sequencing tests, 3 LAMP tests, 3 CRISPR tests, 1 molecular test, 2 mass spectrometric tests, 138 serological tests, 59 antigen tests and 21 collection devices/kits mostly FDA approved or/and CE-marked. BfArM published lists of virus antigen tests for professional use (<https://antigentest.bfarm.de/ords/f?p=110:100:9642059390718:::~&tz=2:00>) and lay use (<https://antigentest.bfarm.de/ords/f?p=ANTIGENTESTS-AUF-SARS-COV-2:TESTS-ZUR-EIGENANWENDUNG-DURCH-LAIEN:8998605889654:::~&tz=2:00>) based on LFA technique. From professional use tests (July 23rd: 545 tests) 212 were evaluated by the Paul-Ehrlich-Institute (PEI), of these 189 point of care (POC) without analyser, 14 POC with analyser and 333 not evaluated by PEI, of these 308 POC without analyser and 21 POC with analyser. The list of lay use tests includes 91 tests (July 23rd), of these 90 evaluated by PEI; sample materials are nasal (63), saliva (19), sputum (2), saliva/nasal (2), saliva/sputum (3), saliva/sputum/nasal (1). In summary, number and quality of tests rapidly increased. Public available lists provide helpful information regarding tests available in the market.

P25

I Elevated proteasome serum concentrations in patients with thymic epithelial tumors

Jonas Bauer^{*1}, Jürgen Thanner¹, Giovanni Bocchialini¹, Maria Laggner¹, Cecilia Veraar², Konrad Hötzenecker¹, Hendrik Ankersmit^{1,3}, Bernhard Moser¹

¹Department of Thoracic Surgery, Medical University of Vienna, Vienna, Austria

²Department of Anaesthesiology, General Intensive Care and Pain Medicine, Division of Cardiac Thoracic Vascular Anaesthesia and Intensive Care Medicine, Medical University of Vienna, Vienna, Austria

³Head FFG Project „APOSEC“, FOLAB Surgery, Medical University of Vienna, Vienna, Austria

Background: Thymic epithelial tumors (TETs) are rare malignancies. Systemic tumor markers facilitating diagnosis and monitoring disease progression have not been established to date. Elevated proteasome serum concentrations were reported in various malignancies and inflammatory processes. We therefore compared serum levels of 20S proteasome and 20S immunoproteasome between TET patients, controls, and healthy volunteers.

Methods: Serum concentrations were quantified by enzyme-linked immunosorbent assays (ELISAs). Prospectively collected preoperative serum samples of patients with TETs ($n=84$), and controls ($n=10$) and age- and gender-matched healthy volunteers ($n=31$) were analyzed. Benign thymic hyperplasia served as controls. Associations with clinical parameters such TNM classification system, cause-specific survival and Myasthenia gravis were statistically evaluated with students T-test, ANOVA, Welch, Brown-Forsythe (for sample sizes <6), ROC and Kaplan Meier curves.

Results: Median serum concentrations of proteasome were significantly increased in patients with TETs compared to healthy controls (443.5 vs 851.6 ng/mL, $p=0.001$). Multivariable analyses revealed significant differences within the stages of the TNM system ($p=0.043$), particularly for distant spread stages

(stage IVb; $p<0.001$) compared to healthy volunteers. There were statistically significant differences ($p=0.022$) between patients with benign thymic hyperplasia (757.1 ng/mL), thymoma (849.9 ng/mL), thymic carcinoma (856 ng/mL) and healthy controls (443.5 ng/mL). Immunoproteasome serum concentrations in TETs were not significantly increased compared to healthy volunteers ($p=0.055$), while higher stage TETs ($>TNM$ stage I tumors) displayed elevated immunoproteasome levels compared to healthy volunteers ($p=0.027$).

Conclusions: Due to the increasing availability of proteasome inhibitors for therapy, elevated proteasome and immunoproteasome serum concentrations in TET patients with advanced disease stages—in particular TNM stage IVb—might serve as diagnostic tools in the future.

P26

I Mean pulmonary arterial pressure/cardiac output slope for the definition of exercise pulmonary hypertension – a systematic review and meta-analysis

Katarina Zeder^{*1,2}, Chiara Banfi³, Gregor Steinrisser-Allex⁴, Andrea Berghold³, Horst Olschewski^{1,2}, Gabor Kovacs^{1,2}

¹Ludwig Boltzmann Institute for Lung Vascular Research, Graz, Austria

²Division of Pulmonology, Department of Internal Medicine, Medical University of Graz, Graz, Austria

³Institute for Medical Informatics, Statistics and Documentation, Medical University of Graz, Graz, Austria

⁴Library of the Medical University of Graz, Graz, Austria

Introduction: The exercise part (mean pulmonary arterial pressure (mPAP) >30 mmHg) of the definition of pulmonary hypertension (PH) was abandoned in 2009, mainly due to the dependence of exercise hemodynamics on age and on pulmonary blood flow. In recent years, several studies aimed to provide data on pulmonary hemodynamics during exercise in healthy subjects and patients with cardio-pulmonary diseases. We aimed to identify exercise hemodynamic parameters with high prognostic and differential diagnostic value that may define exercise PH and provide their normal values as well as clinically relevant cut-offs.

Methods: We performed a systematic literature analysis according to PRISMA guidelines and searched for English-language, peer-reviewed original publications from 1945 until 01.10.2020 that assessed exercise pulmonary hemodynamics by using right heart catheterization. We performed meta-analysis for normative values. Results of prognostic and diagnostic studies are reported descriptively.

Results: We identified $n=45$ ($n=11$ normative; $n=18$ prognostic and $n=16$ diagnostic) studies including in total $n=5598$ subjects ($n=250$, $n=1367$ and $n=3981$). Based on these studies, the mPAP/cardiac output (CO), the pulmonary arterial wedge pressure (PAWP)/CO and the trans-pulmonary gradient (TPG)/CO slopes appeared to be most useful to characterize the pulmonary circulation during exercise. Upper limits of normal were 2.8WU, 1.9WU and 1.4WU for mPAP/CO, PAWP/CO and TPG/CO slope, respectively. The mPAP/CO and PAWP/CO slopes were significantly influenced by age. The mPAP/CO slope >3 WU and the PAWP/CO slope >2 WU were associated with impaired survival and increased cardio-vascular events. A PAWP/CO slope >2 WU showed good differential diagnostic

potential to distinguish between pre- and post-capillary causes of exercise PH.

Conclusion: The mPAP/CO slope with a cut-off >3WU represents the upper limit of normal and is of prognostic relevance. Therefore, it seems suitable to define exercise PH. The PAWP/CO slope with a cut-off >2WU may be best suitable for the differentiation between pre- and post-capillary causes of exercise PH.

P27

I Landsteiner Lung Cancer Study (LALUCA): first data from a prospective lung cancer registry

David Rosenthaler^{*1}, Hannah Fabikan¹, Christoph Weinlinger¹, Maximilian Johannes Hochmair¹, Oliver Illini¹, Dagmar Krenbek², Stefanie Winkler¹, Agnes Attoh³, Klaus Kirchbacher³, Georg Christian Funk³, Arschang Valipour¹

¹Department of Respiratory and Critical Care Medicine, Karl Landsteiner Institute for Lung Research and Pulmonary Oncology, Klinik Floridsdorf, Vienna, Austria

²Department of Pathology, Klinik Floridsdorf, Vienna, Austria

³2nd Medical Department, Karl Landsteiner Institute for Lung Research and Pulmonary Oncology, Klinik Ottakring, Vienna, Austria

Background: "LALUCA" is a prospective lung cancer registry collecting representative data on clinical characteristics, comorbidities, risk factors, and lung cancer treatment response, with a particular focus on molecular biomarker testing and use of next generation sequencing (NGS).

Method: Data from subsequent lung cancer patients included in the registry between November 2020 and June 2021 were analysed. The occurrence of multiple drugable tumour mutations prior to the start of first-line treatment within 247 patients diagnosed with lung cancer were analysed.

Results: Out of 247 patients, 145 patients (58.7 %) were diagnosed with adenocarcinoma, 47 patients (19.0 %) with squamous cell carcinoma, 17 (6.9 %) with non-small-cell lung cancer-not otherwise specified (NSCLC NOS), 33 (13.4 %) with small cell lung cancer (SCLC), and 5 (2 %) patients with other neuroendocrine tumours. In 145 patients with adenocarcinoma tested with NGS an EGFR mutation was found in 9 patients (6.2 %), 7 patients (3.2 %) showed a positive MET-Exon 14 skipping mutation, 3 patients (2.1 %) were positive for ALK-fusion, RET-fusion was detected in 3 patients (2.1 %), and a KRAS G12C mutation in 17 patients (11.7 %).

Treatment with curative intention was applied to 64 patients, whereas 35 (55 %) received neoadjuvant, 18 (28 %) adjuvant and 11 patients (17 %) consolidation therapy. 89 patients received first line palliative treatment, of which 18 (20 %) were treated with targeted therapy, 43 patients (48 %) received a combination of chemo/immuno- therapy, 15 (17 %) immunotherapy only, 11 (12 %) chemotherapy only, and 2 patients (2 %) received other systemic treatment options.

Conclusion: First data from the LALUCA-registry demonstrates a significant proportion of lung cancer patients with potentially drugable treatment targets but also shows that a major part of the patients (77 %) still receive a chemo-, immunotherapy or a combination in a palliative treatment setting. Future analysis from LALUCA will provide more insights into treatment response, both in the curative and palliative setting.

P28

I Cardiopulmonary exercise impairment three to six months after COVID-19 infection: an observational prospective study

Maximilian Gysan^{*1}, Antje Lehmann¹, Dominik Bernitzky¹, Stefan Simon¹, Andrea Schrott², Martin Burtscher³, Marco Idzko¹, Daniela Gompelmann¹, Karin Vonbank¹

¹Medical University of Vienna, Vienna, Austria

²StatistikAmbulanz, Leobendorf, Austria

³University of Innsbruck, Department of Sport Science, Innsbruck, Austria

Introduction: COVID-19 is a global pandemic affecting individuals to varying degrees. There is emerging evidence that even patients with mild symptoms will suffer from prolonged physical impairment.

Methods: In this prospective observational study, lung function and cardiopulmonary exercise testing have been performed in 100 patients 3 to 6 months after COVID-19 diagnosis (post-CoVG). Depending on the severity of SARS-CoV2 infection, patients were divided into asymptomatic or mild to moderate (mild post-CoVG) and severe post-CoVG (hospitalization with or without ICU/NIV). Results have been compared with an age, sex and BMI matched control group (CG, N=50).

Results: Both lung function (resting) and exercise capacity (peak workload, Wpeak and peak oxygen uptake, VO2peak—% predicted) were considerably affected in severe post-CoV patients (81.7 ± 27.6 % and 86.1 ± 20.6 %) compared to the mild post-CoVG (104.8 ± 24.0 % and 100.4 ± 24.8); $p < 0.01$. In addition, also the submaximal exercise performance (predicted VT1/VO2peak and VT2/VO2peak) was significantly reduced in the severe post-CoVG. Multiple linear regression analyses revealed that 74 % of the variance in relative VO2peak of post-CoV patients could be explained by the following variables: lower age, male sex, lower BMI, higher DLCO, higher predicted HRpeak, lower BR and lower SaO2peak, which were related to higher relative VO2peak values. Higher NT-proBNP and lower CK values were seen in severe compared to mild post-CoV patients.

Conclusions: Maximal and submaximal exercise performance in patients recovering from severe COVID-19 remain still negatively affected three to six months after COVID-19 diagnosis. The presented findings reveal that impaired pulmonary, cardiac and skeletal muscle function contributed to the limitation of VO2peak in those patients, which may have important implications on rehabilitation programs.

P29

Clinical characteristics and outcome of extracorporeal membrane oxygenation (ECMO) in acute respiratory distress syndrome (ARDS) related to COVID-19 and influenza – a single center experience

Kevin Roedl^{1*}, Ahmel Kahn¹, Olaf Boenisch¹, Geraldine de Heer¹, Christoph Burdelski¹, Daniel Frings¹, Barbara Sensen¹, Axel Nierhaus¹, Alexander Bernhardt², Hermann Reichenspurner², Dominik Jarczak¹, Stefan Kluge¹, Dominic Wichmann¹

¹Department of Intensive Care Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

²Department of Cardiovascular Surgery, University Heart and Vascular Center Hamburg, Hamburg, Germany

Introduction: Extracorporeal membrane oxygenation (ECMO) represents a viable therapy option for patients with refractory acute respiratory distress syndrome (ARDS). The use of ECMO was utilized during the influenza-pandemic and experienced increasing usage in recent years. ECMO is also currently used to treat patients suffering from coronavirus disease 2019 (COVID-19). However, clinical characteristics and outcome of patients with COVID-19 related ARDS receiving ECMO compared to other viral infections is scarce.

Methods: Retrospective analysis of all consecutive patients receiving ECMO between 01/2009–01/2021 at the University Medical Centre Hamburg-Eppendorf(Germany). All patients with confirmed COVID-19 and influenza were included. Patient characteristics, ICU-/ECMO specific parameters as well as and clinical outcomes were compared and analysed. Mortality was assessed 90-days after start of ECMO.

Results: 113 patients could be included, 52 (46 %) with COVID-19 and 61 (54 %) with influenza. The median age of patients with COVID-19 and influenza was 58 (IQR 53–64) and 52 (39–58) years ($p < 0.001$), 35 % and 31 % ($p = 0.695$) were female, respectively. The Charlson Comorbidity Index was 3 (1–5) and 2 (0–5) points in the two groups ($p = 0.309$). Severity of illness before ECMO displayed by SAPS-II was median 27 (24–36) vs 32 (28–41) points ($p = 0.009$), SOFA 13 (11–14) vs. 12 (8–15) points ($p = 0.853$). The median paO_2 before ECMO was 58 (45–71) and 63 (54–83) mmHg ($p = 0.057$), pH-level was 7.20 (7.16–7.29) and 7.26 (7.18–7.33) ($p = 0.166$). Patients were median 17 (7–27) and 11 (7–20) days on ECMO ($p = 0.295$). 71 % and 69 % had renal replacement therapy ($p = 0.790$). 94 % of patients with COVID-19 and 77 % with influenza experienced a bleeding event associated with ECMO therapy ($p = 0.004$). 34 % and 55 % could be weaned from ECMO ($p = 0.025$). The 90-day mortality after ECMO start was 65 % and 57 % in patients with COVID-19 and influenza, respectively (log-Rank: $p = 0.156$). Median length of ICU-stay was 24 (13–44) and 28 (16–14) days ($p = 0.470$), respectively.

Conclusions: Use of ECMO in ARDS related to COVID-19 or influenza resulted in similar outcome. An increased rate of bleeding complications was observed in patients with COVID-19.

P30

I Clinical findings in patients with persistent respiratory symptoms following COVID-19 compared to asymptomatic post COVID patients: a prospective cohort study

Maximilian Gysan^{1*}, Antje Lehmann¹, Dominik Bernitzky¹, Helmut Prosch², Ruxandra Iulia Milos², Sonja Zehetmayer³, Karin Vonbank¹, Marco Idzko¹, Daniela Gompelmann⁴

¹Department of Pulmonology, Medical University of Vienna, Vienna, Austria

²Department of Biomedical Imaging and Image-guided Therapy, Medical University of Vienna, Vienna, Austria

³Institute for Medical Statistics, Medical University of Vienna, Vienna, Austria

⁴Department of Pulmonology, Medical University of Vienna, Department of Thoracic Surgery, Medical University of Vienna, Vienna, Austria

Introduction: Long-lasting symptoms following SARS-CoV-2 infection that are known as “Long-COVID” are described in several studies. However, there is only limited knowledge about the pathophysiology of Long-COVID and the association with pathological findings in medical examina-

Table 1. Comparison of characteristics, PFT, BGA, laboratory tests and MDCT in patients with persistent respiratory symptoms and without any ongoing symptoms.

	Patients with long lasting respiratory COVID symptoms, n=78	Patients without any long lasting COVID symptoms, n=39	p-value
Age	47.0 ± 15.7	53.1 ± 15.2	0.048
Male (%)	46.2% (36/78)	59% (23/39)	0.266
Hospitalisation in the past due to COVID 19	24.4% (19/78)	23.1 (9/39)	1.000
FVC (L)	4.0 ± 1.1	4.3 ± 1.21	0.224
FVC (%)	91.9 ± 15.7	99.5 ± 13.9	0.012
FVC <80%	19.2% (15/78)	10.3 (4/39)	0.330
TLC (L)	6.1 ± 1.2	6.6 ± 1.4	0.044
TLC (%)	99.2 ± 15.9	104.7 ± 12.7	0.062
TLC <LLN	12.8% (10/78)	2.6% (1/39)	0.097
DLCO SB (%)	79.9 ± 15.7	87.7 ± 17.5	0.016
DLCO SB <80%	42.3% (33/78)	33.3% (13/39)	0.462
DLCO/VA (%)	92.8 ± 12.5	96.3 ± 16.7	0.203
DLCO/VA <80%	11.5% (9/78)	15.4 (6/39)	0.769
pO ₂ (mmHg)	89.2 ± 10.0	88.8 ± 8.9	0.841
pCO ₂ (mmHg)	37.9 ± 3.9	39.2 ± 3.7	0.078
pCO ₂ <35 mmHg	19.2% (15/78)	12.8% (5/39)	0.543
Fibrinogen (mg/dl)	322.2 ± 88.8	327.8 ± 71.9	0.732
Fibrinogen >400 mg/dl	17.9 (14/78)	10.3 (4/39)	0.415
IL-6 (pg/ml)*	1.5 [1.5, 2.4]	1.6 [1.5, 2.3]	0.708
IL-6 ≥7 pg/ml	3.8% (3/78)	5.1% (2/39)	1.000
CRP (mg/dl)*	0.11 [0.05, 0.24]	0.12 [0.06, 0.19]	0.824
CRP >0.5 mg/dl	14.1% (11/78)	10.3% (4/39)	0.771
D-dimer (µg/ml)*	0.29 [0.27, 0.36]	0.28 [0.27, 0.50]	0.358
Ground glass opacities/consolidations / pulmonary embolism in CT	38.5% (30/78)	28.2% (11/39)	0.448

*median [IQR]

Fig. 1 | P30

tions. The objective of this study was to evaluate and compare pathological findings in pulmonary function test (PFT), diffusion capacity measurement, blood gas analysis (BGA), laboratory tests and multi-detector computed tomography (MDCT) in patients with and without long-lasting COVID symptoms.

Methods: In this post hoc analysis of a prospective trial, 135 patients following COVID-19 were enrolled and divided into two groups with respect to the presence or absence of respiratory Long-COVID symptoms. PFT, DLCO, BGA and MDCT findings of patients with persistent respiratory symptoms were compared to those of asymptomatic post COVID patients.

Results: In this analysis, 71 % (96/135) of all patients (mean age 49 years; range 20–91 years) reported long-lasting symptoms after a median (IQR) of 85 days (60–116) following COVID-19 whereby 57.8 % (78/135) complained about persistent pulmonary symptoms. Pathological findings in blood test, PFT, DLCO, BGA and/or MDCT were found in 71.8 % and 64.1 % of patients with and without long-lasting COVID symptoms respectively. Patients with persistent respiratory symptoms were significantly younger and presented a significantly lower FVC (%), TLC (L), and DLCO SB compared to asymptomatic patients ($p < 0.05$). The multiple logistic regression resulted in a significant effect of age ($p = 0.001$) and DLCO SB ($p = 0.017$).

Conclusions: Following COVID-19, a large proportion of patients experience ongoing symptoms, whereby the respiratory symptoms are the predominant complaint. Although the proportion of patients with a DLCO SB < 80 % predicted did not differ significantly between the patient groups with and without symptoms, symptomatic patients presented a lower DLCO SB.

P31

I Subpleural and thoracic wall lesions in 100 consecutive patients with lung cancer from the prospective LALUCA registry – prevalence and potential for ultrasound-guided biopsy

Baki Akca^{*1}, Klaus Kirchbacher¹, Maximilian Hochmair², Oliver Illini², Veronika Stanojevic¹, Florian Vafai-Tabrizi¹, Arschang Valipour², Georg-Christian Funk¹

¹Clinic Ottakring, Vienna, Austria

²Clinic Floridsdorf, Vienna, Austria

Background: Ultrasound is used to guide pleural punctures as well as supraclavicular lymphnode biopsies in the diagnostic work-up of lung cancer. Ultrasound-guided biopsy, however, can also be used for thoracic wall and subpleural lesions. We aimed to clarify the real-world prevalence of intrathoracic lesions potentially accessible for transthoracic ultrasound-guided biopsy in lung cancer.

Methods: Data of 100 consecutive patients with histologically verified lung cancer from the prospectively collected LALUCA (Landsteiner-Lung-Cancer) registry were analysed. Thoracic lesions in the CT scans were categorized according to accessibility in two main groups: not suitable for ultrasound-guided biopsy (“thoracic wall distant lesion”) or suitable for US guided biopsy due to absence of aerated lung between skin and lesion (“thoracic wall close lesion”). The latter group was sub-categorized according to accessibility and estimated procedure risk. Pleural effusions and supraclavicular lymph nodes were not assessed in this study.

Results: 100 patients were included: mean age 69 ± 8 years, 55 males, 85 NSCLC, 15 SCLC; prevalence of clinical stages I, II,

III and IV was 11, 7, 27 and 43, respectively. 12 did not have final staging at the time of data extraction. 57 of 100 patients had thoracic wall distant lesions not accessible for ultrasound-guided biopsy. Of the remaining 43 patients 24 were easily accessible for US-guided biopsy, 15 accessible with low risk and 4 accessible with high risk for potential biopsy related complications. For initial diagnosis, 74 of 100 patients underwent bronchoscopy, 16 ultrasound guided biopsy, 4 CT-guided biopsy and the remaining 6 other modalities. 22 of 74 patients undergoing bronchoscopy, 3 of 4 patients undergoing CT-guided biopsy and 2 of 6 patients undergoing other diagnostic modalities had lesions potentially suitable for ultrasound-guided biopsy.

Conclusion: About one in three patients with lung cancer is potentially suitable for less-invasive ultrasound-guided transthoracic biopsy.

P32

I Male Opioid Addicts present with early and severe COPD

Bernhard Piest¹, Marion Seidlitz², Stefanie Fleimisch³, Bernhard Kaiser³, Philipp Krug³, Daniel Miner³, Michael Studnicka³, Gertraud Weiss^{*3}

¹Practice for General Medicine, Braunschweig, Germany

²Clinic for Addiction Medicine, Braunschweig, Germany

³University Clinic of Respiratory Medicine, Paracelsus Medical University, Salzburg, Salzburg, Austria

Introduction: Overall, COPD is common and cigarette smoking is its most important risk factor. The majority of opioid dependents are smokers and many use cannabis or other toxic substances. Therefore, we investigated the prevalence of COPD in opioid addicts. The aim of the study was to describe COPD prevalence in male opioid dependent substitution patients in primary care, and to compare it with COPD prevalence in a population sample of male smokers.

Methods: In Braunschweig, Germany, smoking, respiratory symptoms, and prior diagnosis (asthma and COPD) were recorded in male opioid addicts. Spirometry was measured, and COPD defined by post-bronchodilator airways obstruction ($FEV_1/FVC < 70$ %). In smokers from Salzburg, Austria COPD prevalence was measured and defined the same way.

Results: 113 of 152 (74 %) male substituted opioid addicts participated, and COPD was present in 25 % (28 of 113); all reported smoking, and 79 % reported cannabis use. In male opioid addicts COPD prevalence was 15 % in 30–39 year olds, 25 % in 40–49 year olds, and 53 % in 50–59 year olds. In male smokers from Salzburg COPD prevalence was 15 % in 40–49 year olds and 42 % in 50–59 year olds. When opioid addicts were compared to those only reporting smoking, age-adjusted COPD prevalence was higher ($p = 0.049$), and severity of COPD as determined by FEV_1 predicted was increased ($p = 0.014$).

Conclusions: In male opioid addicts who are smokers, COPD is more severe and present at younger age compared to non-opioid-consuming male smokers. We conclude that male opioid addicts should be offered spirometry to detect COPD.

P33

I Prognostic relevance of cardiopulmonary exercise capacity in patients with cirrhosis

Teresa Dolze^{*1,2}, Gabor Kovacs^{1,2}, Vasile Foris^{1,2}, Rufolf Stauber³, Horst Olschewski^{1,2}, Philipp Douschan^{1,2}

¹Medical University of Graz, Department of Internal medicine, Division of Pulmonology, Graz, Austria

²Ludwig Boltzmann Institute for Lung Vascular Research, Graz, Austria

³Medical University of Graz, Department of Internal medicine, Division of gastroenterology and hepatology, Graz, Austria

Background and aims: Liver cirrhosis is associated with muscle wasting leading to progressive impairment of cardiopulmonary exercise capacity. In this study, we aimed to investigate the prognostic relevance of cardiopulmonary exercise testing (CPET) and 6-minute-walk-test (6MWT) on transplant-free survival in patients with cirrhosis.

Methods: We prospectively enrolled patients with liver cirrhosis and no relevant cardiopulmonary comorbidities in this study. Besides CPET and 6MWT, all patients underwent echocardiography, pulmonary function testing, blood gas analysis and laboratory tests. Subjective reasons for exercise termination were assessed. CART analysis and COX-regression were performed to check for prognostic cut-offs of peak oxygen uptake (VO₂) and 6MWT.

Results: We enrolled 197 patients (male $N=152$, age: 57yrs (50–62)). Ninety-two patients were in Child-Pugh class A, 81 in class B and 25 in class C. Median follow-up was 30 months. Exercise capacity was significantly impaired depending on liver disease severity (peakVO₂%predicted: Child-Pugh A 71 % (57–92), B 50 % (40–60), C 42 % (35–54), $p<0.001$; 6MWT: Child-Pugh A 459 ± 73 m, B 402 ± 81 m, C 342 ± 93 m, $p<0.001$). There was a significant inverse correlation between Child-Pugh score and peakVO₂/6MWT, ($R=-0.451/-0.470$, $p<0.001$). The most frequent subjective reasons for exercise termination at CPET were musculoskeletal 65 % ($N=133$) and dyspnea 17 % ($N=34$). Forty-five patients underwent liver transplantation during the observation period (2006–2017) and were excluded from survival analysis. Fifty (33 %) of the remaining patients died during the observation period. CART analysis revealed prognostic cut-offs for peakVO₂ at 68 %-predicted (HR 4.72, 95 %CI: 1.68–13.29; $p=0.003$) and for 6MWD at 503 m (HR 5.22, 95 %CI: 1.22–22.29; $p=0.026$) and 384 m (HR: 10.02, 95 %CI: 2.34–42.83; $p=0.002$).

Conclusions: Chronic liver failure is associated with substantial impairment of exercise capacity. Impaired cardiopulmonary exercise performance is associated with worse transplant-free survival.

P34

I Associations of hyponatremia and SIADH with increased mortality, young age and infection parameters in tuberculosis

Christina Bal^{*1}, Daniela Gompelmann¹, Michael Krebs², Lukasz Antoniewicz¹, Claudia Guttman-Ducke¹, Christopher Oliver Milacek¹, Antje Lehmann¹, Maximilian Robert Gysan¹, Peter Wolf², Maaia-Margo Jentus¹, Irene Steiner³, Marco Idzko¹

¹Department of Medicine II, Division of Pulmonology, Medical University of Vienna, Vienna, Austria

²Department of Medicine III, Division of Endocrinology, Medical University of Vienna, Vienna, Austria

³Center for Medical Statistics, Informatics, and Intelligent Systems (CeMSIS), Section for Medical Statistics, Medical University of Vienna, Vienna, Austria

Introduction: Hyponatremia and the syndrome of inappropriate antidiuretic hormone secretion (SIADH) are associated with and can be caused by tuberculosis (TB) by locally invading the hypothalamus, adrenal, or pituitary glands, through meningitis or ectopic ADH production. This study in a large cohort of a university hospital in Austria was performed to assess the association of TB mortality with hyponatremia and SIADH.

Methods: This retrospective study enrolled patients with hyponatremia and patients diagnosed with TB in the time period of 01/2001–11/2019 to calculate the cut amount of those who meet both diagnostic criteria. Sex, age, microbiological results, laboratory tests and comorbidities were analysed and survival rates were calculated.

Results: Eighty out of 107.532 patients with hyponatremia (0.07 %), and out of 186 patients with TB (43 %) were diagnosed with both—hyponatremia and TB. Young age and high CRP levels were significantly associated with a TB diagnosis ($p<0.0001$). Survival rates of patients diagnosed with TB and moderate to profound hyponatremia were significantly lower compared to TB patients without hyponatremia ($p=0.03$).

Conclusions: In this study of a large cohort from a tertiary care hospital in a non-endemic area of TB, 0.07 % of patients presenting with hyponatremia, but especially younger patients and patients with high CRP values, were diagnosed with TB. Crucially, patients with moderate to profound hyponatremia had a significantly higher mortality rate, and thus require increased medical care.

P35

I Durvalumab after sequential, dose-accelerated Radiotherapy (DART) and concomitant chemoradiotherapy in NSCLC stage III patients: a bicentric retrospective analysis

Romana Wass^{*1}, Franz Zehentmayr², Gertraud Weiss¹, Maximilian Hochmair³, Petra Feuerstein³, Michael Studnicka¹

¹University Clinic of Respiratory Medicine, Paracelsus Medical University Salzburg, Salzburg, Austria

²University Clinic of Radiotherapy and Radio-Oncology, Paracelsus Medical University Salzburg, Salzburg, Austria

³Karl Landsteiner Institute of Lung Research and Pulmonary Oncology, Department of Respiratory and Critical Care Medicine, Hospital North, Vienna, Austria

Background: For patients with unresectable stage III non-small-cell lung cancer (NSCLC) Durvalumab maintenance therapy after concurrent chemo radiotherapy, is considered the standard of care (SOC) in patients with PD-L1 >1 %. Dose differentiated accelerated radiotherapy (DART-bid) is a radiation dose escalation strategy (twice daily 1,8 Gy). This retrospective study aims at evaluating pulmonary toxicity of Durvalumab after high dose irradiation with DART compared to SOC chemo radiotherapy.

Methods: Pulmonary toxicity was evaluated in patients treated with Durvalumab. Two NSCLC groups were compared: those receiving SOC chemoradiation followed by maintenance Durvalumab therapy, and those receiving dose differentiated accelerated radiotherapy (DART) in combination with sequential chemo radiation and Durvalumab maintenance. After completion of radio chemotherapy patients received 10 mg/kg Durvalumab intravenously every 2 weeks for up to 12 months, unless there was progressive disease or intolerable treatment related toxicity.

Results: The median radiation doses were 79,2 Gy (range: 73,8–79,2 Gy) in the DART-bid group compared to 50,4 Gy (range: 30–70 Gy) in the SOC group. The median latency for the start of Durvalumab was 48 days after completion of radiotherapy (range: 8–114 days), with a median number of eleven courses (range: 1–25) administered. As for pulmonary toxicity: in the DART-bid group pneumonia was reported in 13 %, and pneumonitis in 13 % (0 % grade 1, and 100 % grade 2), while in the SOC group pneumonia was reported in 0 %, and pneumonitis in 26 % (50 % grade 1, and 50 % grade 2). Pneumonitis of grade 3 or higher was not reported in either group.

Conclusion: Sequential high dose radiotherapy followed by durvalumab is well tolerated and pulmonary toxicity similar to SOC treatment. Hence, sequential DART-bid might be an alternative for patients with NSCLC stage III, who are not eligible for concurrent chemoradiotherapy.

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10 Minutes For Your Lungs – a COPD Case Finding Study in 536 Austrian pharmacies

Philipp Krug^{*1}, Gertraud Weiss¹, Fikreta Grabcanovic-Musija¹, Maria Flamm², Bernd Lamprecht³, Bernhard Kaiser³, Christian Müller-Uri⁴, Michael Studnicka¹

¹University Clinic of Respiratory Medicine, Paracelsus Medical University Salzburg, Salzburg, Austria

²Institute for General Practice, Family Medicine and Preventive Medicine, Paracelsus Medical University Salzburg, Salzburg, Austria

³University Dep. of Resp. Medicine, Johannes-Kepler-University, Linz, Austria

⁴Austrian Chamber of Pharmacists, Vienna, Austria

Objective: Chronic Obstructive Pulmonary Disease (COPD) causes an enormous burden of morbidity and mortality worldwide, but the majority of cases goes unrecognized and untreated. Case finding for COPD is a possible option for early treatment. We herein report '10 Minutes for Your Lungs'—a COPD case finding initiative realized in Austrian pharmacies.

Methods: During 4 weeks of study, customers to pharmacies completed the Salzburg COPD screening questionnaire

(SCSQ) on smoking and respiratory symptoms. Lung function (FEV1, FEV6) was measured with the simple COPD6[®] device. The presence of smoking, symptoms and airways obstruction defined three COPD risk categories (no risk, intermediate and high risk).

Results: Overall 23,272 customers provided questionnaire and lung function and 43 customers (SD 35) participated at each pharmacy. We analysed 18,876 participants concerning their COPD risk (63.2 % female, mean age (SD) 65.1 (11.8) years; 18.6 % current and 29.0 % former smokers). High risk for COPD was defined present in 13 %, intermediate risk in 34.5 %, and no risk in 52.5 % of participants.

We compared participants at high risk for COPD with participants reporting a former COPD diagnosis. When analysing participants with airways obstruction (FEV1/FEV6 ratio below 0.7), those at high COPD risk were more often female (57.9 vs 48.2 %), of similar age (68.4 vs 67.9 years), and had greater FEV1% pred (60.5 % vs 57.7 %).

2450 study participants were advised to see a lung specialist and 190 (7.8 %) returned their feedback. The comparison of lung function done by the pharmacy with lung function done by the lung specialist showed that FEV1 measured by the lung specialist was on average 150 ml greater.

Conclusion: We conclude that pharmacies are well suited for COPD case finding using questionnaire and simple lung function testing. To our knowledge, the study '10 Minutes for your Lung' provides the most extensive evidence on this issue.

P37

Benefits of pulmonary rehabilitation in COVID-19: a prospective observational cohort study

Daniela Leitl^{*1,2}, Rainer Glöckl^{1,2}, Inga Jarosch^{1,2}, Tessa Schneeberger^{1,2}, Christoph Nell³, Nikola Stenzel⁴, Claus F. Vogelmeier⁵, Klaus Kenn^{1,2}, Andreas R. Koczulla^{1,2,6}

¹Department of Pulmonary Rehabilitation, Philipps-University of Marburg, Member of the German Center for Lung Research (DZL), Marburg, Germany

²Institute for Pulmonary Rehabilitation Research, Schoen Klinik Berchtesgaden Land, Schoenau a. K., Germany

³Department of Pulmonology, Philipps-University Marburg, Marburg, Germany

⁴Psychologische Hochschule Berlin (PHB), Berlin, Germany

⁵Department of Medicine, Pulmonary and Critical Care Medicine, University Medical Centre Giessen and Marburg, Philipps-University of Marburg, Member of the DZL, Marburg, Germany

⁶Teaching Hospital, Paracelsus Medical University, Salzburg, Austria

Background: Corona-Virus disease (COVID-19) can result in a large variety of chronic health issues like impaired lung function, reduced exercise performance, and diminished quality of life. Our study aimed to investigate the efficacy, feasibility, and safety of pulmonary rehabilitation (PR) in COVID-19 patients and to compare outcomes between patients with a mild/moderate and a severe/critical course of the disease.

Methods: Patients in the post-acute phase of a mild to critical course of COVID-19 admitted to a comprehensive three-week inpatient PR were included in this prospective, observational cohort study. Several measures of exercise performance (6-minute walk distance, 6MWD), lung function (forced vital

capacity, FVC), and quality of life (36 question short-form health survey, SF-36) were assessed before and after PR.

Results: Fifty patients were included in the study (24 with mild/moderate and 26 with severe/critical COVID-19). On admission, patients had a reduced 6MWD (mild: 509 m [426–539]; severe: 344 m [244–392]), an impaired FVC (mild: 80 % [59–91]; severe: 75 % [60–91]) and a low SF-36 mental health score (mild: 49pts [37–54]; severe: 39pts [30–53]). Patients attended a median of 100 % [94–100] of all provided PR sessions. At discharge, patients in both subgroups improved in 6MWD (mild/moderate: +48 m [35–113 m]; severe/critical: +124 m [75–145 m], both $p < 0.001$), FVC (mild/moderate: +7.7 % [1.0–17.8], $p = 0.002$; severe/critical: +11.3 % [1.0–16.9], $p < 0.001$) and SF-36 mental component (mild/moderate +5.6pts [1.4–9.2], $p = 0.071$; severe/critical: +14.4pts [−0.6–24.5], $p < 0.001$). No adverse event was observed.

Conclusion: Our study shows that PR is a feasible, safe, and effective therapeutic option in COVID-19 patients independent of disease severity.

P38

I Effects of an automatic oxygen system during walking in hypoxemic patients with severe COPD – a randomized controlled double-blind cross over trial

Tessa Schneeberger^{*1}, Inga Jarosch^{1,2}, Daniela Leitl^{1,2}, Rainer Gloeckl^{1,2}, Wolfgang Hitzl, Clancy Dennis⁶, Tatjana Geyer¹, Carl-Peter Criée⁷, Klaus Kenn¹, Rembert Koczulla^{1,2,8}

¹Department of Pulmonary Rehabilitation, Philipps University of Marburg, Marburg, Germany

²Institute for Pulmonary Rehabilitation Research, Schoen Klinik Berchtesgadener Land, Schoenau am Koenigssee, Germany

³Paracelsus Medical University Salzburg, Research Office (Biostatistics), Salzburg, Austria

⁴Paracelsus Medical University Salzburg, Department of Ophthalmology and Optometry, Salzburg, Austria

⁵Paracelsus Medical University Salzburg, Research Program Experimental Ophthalmology and Glaucoma Research, Salzburg, Austria

⁶The University of Sydney, Faculty of Medicine and Health, Sydney, Australia

⁷Department of Sleep and Respiratory Medicine, Evangelical Hospital Goettingen-Weende, Bovenden, Germany

⁸Teaching hospital, Paracelsus Medical University, Salzburg, Austria

Introduction: Supplemental oxygen (O_2) in people with COPD is usually delivered as a constant-flow that may result in reduced oxygen saturation (SpO_2) during walking. An automatic oxygen system (FreeO₂, OxyNov) titrates O_2 -flow to maintain a SpO_2 -target. There is evidence of benefit compared to flows of 2L/min or “resting prescription + 1L/min”, but as yet has not been compared to O_2 -flows titrated for exercise. Further, higher flows from automatic O_2 -system (0–20L/min) may have an effect on partial pressure of carbon dioxide (PCO_2). Primary aim was to investigate the effects of automatic O_2 -flows compared to titrated constant O_2 -flows (as per guidelines) on walking capacity in COPD.

Methods: Fifty diagnosed COPD and $PO_2 < 55$ mmHg at rest or exercise participants completed this randomized

controlled double-blind cross-over trial ([ClinicalTrials.gov: NCT03803384](https://clinicaltrials.gov/NCT03803384)).

Each performed, with breaks of 24 h, 2 Endurance Shuttle Walk Tests (ESWT) at 85 % of maximum using: (A) constant- O_2 (ESWTconstant) and (B) automatic- O_2 (SpO_2 -target = 92 %) (ESWTautomatic). Primary outcome was walking endurance time. Secondary measures of SpO_2 , transcutaneous- PCO_2 [$TcPCO_2$], respiratory-rate [RR], heart-rate [HR] were compared at isotime (end of shortest ESWT) and pre-and post-test blood gases and dyspnea (Borg-scale) were sampled.

Results: Participants (65 ± 8 years, FEV_1 30.5 ± 8 %pred., PO_2 54.7 ± 6 mmHg, PCO_2 43.9 ± 6 mmHg, prescribed exercise O_2 -flow 3.0 [3.0, 4.0] L/min; median [upper, lower limit]) walked significantly ($p < 0.001$) longer in ESWTautomatic compared to ESWTconstant (522 [277, 1200] s vs. 333 [214, 581] s).

During ESWTautomatic, SpO_2 isotime was significantly higher (92 [90, 94] % vs. 89 [86, 93] %) whereas other measures ($TcPCO_2$, RR, HR) were comparable.

At ESWT end, PO_2 and dyspnea significantly differed in favor of the automatic O_2 -flow-system (average automatic O_2 -flow 4.5 [3.2, 6.1] L/min) while PCO_2 was comparable.

Conclusions: In hypoxemic patients with severe COPD the use of automatic O_2 -flows during exercise lead to significant improvements in walking endurance time, SpO_2 , PO_2 and dyspnea. Higher O_2 -flows with the automatic system did not affect PCO_2 .

P39

I Comprehensive pulmonary rehabilitation decreases frailty in lung transplant recipients – a prospective observational study

Tessa Schneeberger^{*1}, Maximilian Gaida², Inga Jarosch^{1,2}, Daniela Leitl^{1,2}, Rainer Gloeckl^{1,2}, Klaus Kenn¹, Rembert Koczulla^{1,2,3}

¹Department of Pulmonary Rehabilitation, Philipps University of Marburg, Marburg, Germany

²Institute for Pulmonary Rehabilitation Research, Schoen Klinik Berchtesgadener Land, Schoenau am Koenigssee, Germany

³Paracelsus Medical University Salzburg, Teaching hospital, Salzburg, Austria

Introduction: Frailty and lung transplantation (LTx) success are closely linked. Frailty is known to cause a reduction in physical performance in LTx patients, increased re-hospitalization rates after surgery and is associated with a higher one-year mortality rate post LTx compared to non-frail patients. Addressing frailty of post LTx patients could be important to improve LTx outcomes.

Our aim was to investigate the effects of a comprehensive PR-program on frailty in post LTx patients.

Methods: Participants with confirmed COPD or interstitial lung disease, post LTx (<1 year after LTx) undergoing an inpatient PR-program were included in this trial ($n = 33$). Primary outcome was the change in frailty measured by short physical performance battery test performed at PR-admission and discharge (SPPB; score 0–12). SPPB results are categorized into frail (SPPB ≤ 7); pre-frail (SPPB = 8–9) and not-frail (SPPB ≥ 10). Participants with an SPPB score ≤ 11 at baseline were included in the final analyses. [ClinicalTrials.gov: NCT04184180](https://clinicaltrials.gov/NCT04184180).

Results: Twenty-four participants (58 ± 4 years; FEV_1 66 ± 13 %pred., SPPB-baseline: frail: $n = 6$ [25.0 %], pre-frail: $n = 16$ [66.7 %]; not-frail: $n = 2$ [8.3 %]) were analysed ($n = 4$

SPPB>11; $n=5$ dropouts). Baseline average SPPB-score (8.0 ± 1.6) significantly ($p < 0.001$) improved $+2.7$ 95 %CI [2.1 to 3.2] over the PR-program. Post PR, frail participants changed either to pre-frail ($n=2/6$) or not-frail ($n=4/6$) and the majority of pre-frail changed to not-frail ($n=12/16$). All but one participant improved in SPPB-score by at least 1 unit (minimal important difference SPPB=1).

Conclusion: A comprehensive PR-program significantly reduced frailty in post LTx patients by a clinically relevant amount.

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