Diagnosis of pneumonia II

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QUANTITATIVE RELATIONSHIP BETWEEN SALIVARY AND GASTRIC BACTERIAL COUNTS AND NOSOCOMIAL PNEUMONIA WITH IDENTICAL STRAINS IN ICU PATIENTS. M. T. Garrouste*, O. Marie, S. Chevret, N. Popoff, G. Leleu, M. Rouveau, G. Arlet, S. Villiers. B. Schlemmer.

In mechanically ventilated patients (pts), nosocomial pneumonia (NP) often originates from oropharyngeal (O) and gastric (G) flora. The main bacterial reservoir is not clearly defined. The goal of this study was to establish a relationship between quantitative bacterial culture of salivary (S) and (G) samples and the occurence of NP. We conducted a preliminary prospective survey in 46 ICU medical (n = 33) and surgical (n = 13) pts, ventilated on entry, with an ICU stay over 48 H. Gastric pH, S and G samples were studied on entry and twice weekly by quantitative cultures (>100 cfu/ml) on appropriate media for Gram negative bacilli, *S aureus, Enterococcus* and yeasts. Bacteria were compared by molecular typing (pulsed field gel electrophoresis). Nosocomial pneumonia was strictly defined by the association of clinical, radiologic and microbiologic quantitative criteria. To identify risk factors for NP, baseline characteristics of the infected pts were compared with those of controls, as well as previous occurrence of S or G colonization (> 10^6 cfu/ml), by score test, using Cox's model. Relative risk (RR) of developing NP was estimated by exponentiation of each Cox's regression coefficient. 11 NP (5 *Acinetobacter sp.*, 3 *Enterobacter sp.*, 1 *S. aureus*, 1 *Klebsiella pneumoniae*, 1 *Enterococcus*) were observed. The NP rate was estimated at 9 p. cent at day 5, and 29 p. cent at day 10. Pts with NP were more likely than controls to have immunodeficiency (p = .04) and longer previous hospitalization (p = .05), but immunodeficiency was the only independent risk factor for NP selected by the multivariate analysis (RR = 3.6, p = .04). Otherwise, no influence was observed on the risk of developing NP by G colonization (RR = .9, p = .83), while influence, although not significant, was exerted by S colonization (RR = 2, p = .40). Moreover, such influence strongly appeared on the risk of developing *Acinetobacter sp.* NP: previous salivary culture for *Acinetobacter sp.* > 10^6 cfu/ml increased about 14-fold the risk of developing *Acinetobacter sp.* NP (p = .006).

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PNEUMONIA IN PATIENTS RECEIVING CONTINUOUS MECANICAL VENTILATION. Outcome of Protected Specimen Brush after 48 H of antimicrobial therapy.
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Protected Specimen Brush (PSB) and quantitative culture offer a sensitive and specific approach to establish the causative organism in cases of pneumonia and in differentiating between colonization of the upper respiratory tract and distal lung infection in ventilated patients. Very few are known of the results of PSB in patients receiving antimicrobial therapy.

Twenty patients receiving mecanical ventilation with pneumonia (fever, new infiltrate on chest roentgenogram, presence of macroscopically purulent tracheal aspirates and PSB with quantitative culture $\geq 10^3$ cfu/ml) underwent PSB for the diagnosis of pneumonia and 48 H after receiving antibiotics (CEFOTAXIME + METRONIDAZOLE 10 patients, AMOXICILLIN-CLAVULANIC ACID + TOBRAMYCIN 10 patients).

Seven patients had aspiration pneumonia (during drug overdose in 6), 5 community-acquired pneumonia and 8 nosocomial pneumonia. Fourteen PSB isolate one bacterial species and 6 more than one. Streptococcus pneumoniae were isolated in 11 patients, Haemophilus influenzae in 6, Enterobacteriaceae in 4, Staphylococcus aureus in 2.

After 48 H of antimicrobial therapy PSB culture was < 10^3 in all cases but one (PSB > 10^3 Staphylococcus aureus in a patient receiving CEFOTAXIME + METRONIDAZOLE).

Antimicrobial therapy rapidly make quantitative culture of PSB negative (< 10^3 cfu/ml) in sensible strains. It expose to false negative results of PSB.

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DIAGNOSIS OF NOSOCOMIAL PNEUMONIA USING CYTOLOGIC EXAMINATION OF BRONCHOALVEOLAR LAVAGE.
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Quantitative cultures of protected specimen brushing (PSB) and bronchoalveolar lavage (BAL) are the usual methods for the diagnosis of nosocomial pneumonia (NP) in mechanically ventilated (MV) patients. However, these techniques are not useful for the institution of an initial antibiotic treatment because the results are not available until 24-48 hours after sampling. The present study was designed to evaluate the utility of BAL cells with intracellular bacteria (CIB) in the early diagnosis of NP in MV patients.

Method. We studied 36 patients under MV for more than 3 days with clinical suspicion of NP. NP was diagnosed by quantitative cultures equal or above 10^3 cfu/ml (PSB) or 10^4 cfu/ml (BAL) and clinical or pathologic criteria. Direct examination of BAL cytospin specimens stained with Giemsa and Gram stain was used to identify CIB.

Results. 16 patients (44%) were diagnosed of NP according to these criteria. In the remaining 20 patients, the pulmonary infiltrates were atttributed to atelectasis (11 patients), ARDS (5 patients) and left ventricular failure (4 patients). P.aeruginosa was the most frequent microorganism (8 patients) and polymicrobial cultures were found in 5 out of the 16 patients. In 12 of the 16 patients with NP fluid recovered by BAL contained CIB in a percentage of 12.2 ± 12.8 %. In 4 patients with NP (3 caused by P. aeruginosa) we didn't see any CIB. In patients without NP the mean percentage of CIB was 0.5 ± 1.3% (p < 0.05). The Gram stain of CIB was congruent with the cultures of PSB and BAL. Assuming a cut-off point of 7% in the differential count, the sensitivity of the technique was 75% and the specificity was 100%.

Discussion. These results suggest that the identification of CIB in the BAL is a good indicator of NP in patients under MV. The sensitivity of this technique seems to be lower in P.aeruginosa infections.

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COMPARISON OF PROTECTED CATHETER vs PROTECTED BRONCHOALVEOLAR SAMPLES IN DIAGNOSIS OF PNEUMONIA IN VENTILATED PATIENTS
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Recent reports suggest that the use of protected bronchoalveolar lavage (PBAL) performed through a protected bronchial catheter (PTC) is effective in collecting distal respiratory tract secretions with a low degree of contamination, in ventilated patients (pts) with pneumonia. We compared the contamination rate of PBAL and of PTC specimens obtained during fiberoptic bronchoscopy (FOB) in 23 adult ventilated pts for > 48 hrs suspected of having lower respiratory tract infection. PTC was advanced into the distal airways, and secretions were aspirated; without removing the FOB a second protected catheter was introduced and 3X20 ml of physiologic saline were injected into the distal airways and reaspirated. The samples were processed for direct examination after centrifugation (Gram stain) and quantitative culture. A quantitative culture > 10^3 and > 10^4 CFU/ml in PTC and PBAL respectively were considered as positive. Results. 9 pts had a diagnosis of pneumonia. In 20/23 pts, PTC and PBAL culture results were concordant (7 with pneumonia). In 13/20, the Gram stain examination of both samples gave similar results. In the 7 other pts, PBAL Gram stain showed microorganisms but not PTC (4 of these pts had microbiologically confirmed pneumonia). PBAL cultures showed ≥ different organisms than PTC in 6/20 pts but the cultures were < 10^4 cfu/ml indicating mild contamination. In 3 pts, cultures were not concordant: in 2 clinical and radiological findings were consistent with pneumonia, PBAL showed < 10^4 cfu/ml while PTC showed > 10^3 cfu/ml. In 1 pt, under antibiotic therapy and poor evidence of clinical pneumonia, PBAL showed 10^4 while PTC showed < 10^2 cfu/ml. Conclusion. These preliminary results suggest that a higher rate of mild contamination must be expected from PBAL samples than PTC, without improving the detection of infection by Gram stain and cytologic examination.

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BRONCHOSCOPIC OR NON-BRONCHOSCOPIC BRONCHO-ALVEOLAR LAVAGE (BAL) FOR DIAGNOSING PNEUMONIA IN ICU.

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Two BAL techniques were compared in 38 mechanically ventilated patients with suspected pneumonia : protected non bronchoscopic BAL (Mini BAL 20 ml injected) and bronchoscopic BAL (B-BAL 2 x 50 ml injected). BAL fluid differential cell count was performed on 39 pairs of samples but the count was technically impossible (too few cells or only mucus recovered) in 10 % (4/39) B-BAL and in 28 % (11/39) Mini BAL ($p<0.05$). Bronchial contamination (>5% ciliated cells) was found in 17 % (6/35) B-BAL and 21 % (6/28) Mini BAL samples (NS). Microscopic examination and quantitative culture were performed on 34 pairs of samples. B-BAL and Mini BAL positive or negative microscopic examination and positive or negative culture correlated ($p< 0.001$). Sterile B-BAL and Mini-BAL culture agreed in 8/15 cases (53 %). Out of the 19 positive pairs, culture results agreed on 27/32 (84 %) of the recovered microorganisms. With a diagnosis of pneumonia established on B-BAL quantitative culture $\geq 10^3$ CFU/ml, Mini BAL gave false negative results in 23 %(4/17) of cases of pneumonia and false positive results in 35 % (6/17) of cases without pneumonia (sensitivity : 76 % - specificity : 65 %). These results suggest that Mini BAL allows recovery of alveolar samples but its specificity appears lower than B-BAL in culture.

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DIAGNOSTIC VALUE OF ELASTIN FIBERS IN THE DIAGNOSIS OF VENTILATOR-ASSOCIATED PNEUMONIA.

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We prospectively studied 70 mechanically ventilated (MV) patients by examination of endotracheal aspirates for elastin fibers, graded Gram's stain, and quantitative bacterial cultures.Patients were classified in four diagnostic categories established before initiation of the study:1) definite infection (N=25); group A, 2) probable infection(N=20); group B, 3) uncertain status (N=15); group C, and, 4) control group; group D (N=10). All patients were on antibiotic treatment when the study was performed. Endotracheal aspirates were obtained sterilely, using a suction catheter. A purulent portion of the aspirate was mixed at a 1:1 ratio with 40% KOH, incubated at 37°C for 30 min. A drop was placed on a clean slide and a cover slip 22x40 mm was applied. The KOH resistant fibers were identified at x400 standard light microscopy. The KOH preparation was positive when the characteristic split-end fibers were detected. For analysis, patients with definite and probable infection, and patients of the uncertain status and control groups were grouped together. We found that elastin fiber positivity had a sensitivity of 36% and a specificity of 88% for infection. The presence of tracheal aspirates elastin fibers was more frequent in group A patients (16/45, 35.5%)) as opposed to all colonized patients (3/25, 12%)($p<0.05$). No correlation was found between the presence of elastin fibers and quantitative tracheal cultures nor with the Gram stain grades (r=-0.2 p:NS). Elastin fibers did not increase sensitivity of EA quantitative cultures using a cut-off point of 10^5 cfu.ml^{-1}. The development of elastin fibers occurred most frequently during infection with Gram-negative bacilli (9/16). By contrast, MV pneumonia due to Gram-positive cocci, *Legionella*, or non bacterial agents uncommonly (2/19,10%) gave positive KOH preparations. In conclusion, KOH preparation for elastin fibers is a rapid and simple marker of MV pneumonia and is useful to detect part of the cases caused by Gram-negative bacilli.

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Cerebral blood flow I

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DOBUTAMINE INCREASES CEREBRAL BLOOD FLOW VELOCITY IN SEPTIC PATIENTS

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Sepsis can be associated with a reduction in cerebral blood flow (CBF). Although, dobutamine (DOB) has been used to increase O_2 delivery in septic patients, its effects on the cerebral circulation have not been well defined. Therefore, the effects of increasing doses of DOB (0,2,4,6,8,10 and 0 mcg/kg/min) on the velocity in a middle cerebral artery (Vmca) were studied in 14 stable septic patients (39-72 years). The following parameters were recorded: heart rate (HR), mean arterial pressure (MAP), cardiac index (CI)(thermodilution), arterial and mixed venous blood gases and saturations. Vmca was measured by transcranial Doppler. The arteriojugular oxygen content difference ($AJDO_2$) and the cerebral oxygen extraction (CEO_2) were determined using a catheter inserted into the jugular bulb. Arterial PCO_2 and PO_2 remained constant (35±1 and 101±9 mmHg, respectively).

DOB,mcg/kg/min	0	4	8	10	0
HR,bpm	94±5	102±5*	108±5*#	118±5*#	97±5
MAP,mmHg	77±3	86±4*	83±4*	82±5*	72±4
CI,l/min/m^2	3.8±.3	5.0±.4*	5.7±.5*#	6.3±.5*#	4.1±.3
Vmca,cm/sec	68±6	74±7*	75±8*	80±7*#	69±7
$AJDO_2$,ml/dl	4.1±.2	3.7±.2*	3.6±.3*		4.1±.2
CEO_2,%	46±3	41±4*	40±4*		47±4

* p<.01 vs 0; # p<.01 vs previous value (±SE) (two way ANOVA).

The increase in CI and MAP induced by dobutamine is associated with increased Vmca and $AJDO_2$, and with reduced CEO_2, suggesting an increase in CBF.

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RELATIONSHIP BETWEEN TRANSCRANIAL DOPPLER MEASUREMENTS AND JUGULAR BULB HEMOGLOBIN SATURATION DURING AN INCREASE IN CEREBRAL BLOOD FLOW

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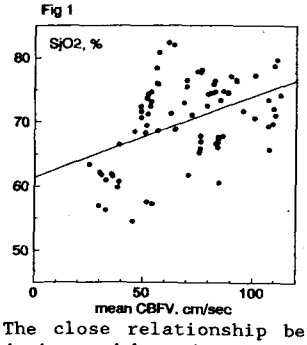
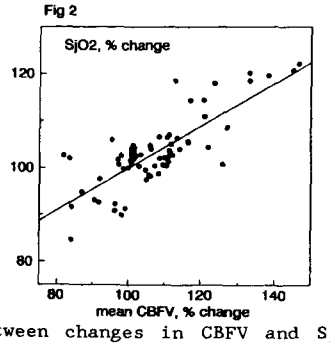
We investigated the relationship between cerebral blood flow velocity (CBFV) and the oxyhemoglobin saturation into the jugular bulb (SjO_2) in 14 critically patients during an increase in cerebral blood flow induced by increasing doses of dobutamine (2,4,6,8,10 mcg/kg/min). Transcranial Doppler was used to measure CBFV. Statistical analysis included ANOVA for repeated measures and linear regression. There was a correlation between mean CBFV and SjO_2 ($r=0.45$, $p<0.001$)(Fig 1). There was a stronger correlation between changes in mean CBFV and changes in SjO_2 ($r=0.80$, $p<0.001$)(Fig 2).





The close relationship between changes in CBFV and SjO_2 during a dobutamine infusion suggests that either jugular bulb oximetry or transcranial Doppler can be used to assess changes in cerebral blood flow.

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