

# Is Latin America Ready to Identify Anaplastic Large Cell Lymphoma in Breast Implants Patients? Regional Encounter During the National Plastic Surgery Meeting in Cancun, Mexico

Guillermo Ramos-Gallardo<sup>1</sup> · Jesus Cuenca-Pardo<sup>1</sup> · Lazaro Cardenas-Camarena<sup>1</sup> · Hector Duran-Vega<sup>1</sup> · Eugenio Rodríguez-Olivares<sup>1</sup> · Jorge Enrique Bayter-Marin<sup>1</sup> · Gerardo Levelier De Doig Alvear<sup>1</sup> · Guillermo Vazquez<sup>2</sup> · Montserrat Fontbona-Torres<sup>3</sup> · Ricardo Galán-Suárez<sup>4</sup> · Gabriela Guzman-Stein<sup>5</sup> · Sergio Guzmán-Padilla<sup>6</sup> · Guillermo Echeverría-Roldán<sup>7</sup> · Jose Fernando Silva-Gavarrete<sup>7</sup> · Alfonso Vallarta-Rodríguez<sup>1</sup> · Livia Contreras-Bulnes<sup>1</sup> · Carlos Guillemro Oaxaca-Escobar<sup>1</sup> · Isabel Caravantes-Cortes<sup>1</sup> · María Eugenia Flores<sup>8</sup> · Jorge Cowes-McGowen<sup>9</sup> · María Liz Maciel-Sosa<sup>10</sup> · Ricardo Delgado-Binasco<sup>11</sup> · Linda Rincón-Rubio<sup>12</sup>



Received: 13 March 2018 / Accepted: 28 April 2018 / Published online: 16 May 2018  
© Springer Science+Business Media, LLC, part of Springer Nature and International Society of Aesthetic Plastic Surgery 2018

## Abstract

**Introduction** Anaplastic large cell lymphoma associated with breast implants is receiving increased attention. Most cases have been reported in Europe, North America (USA and Canada), Australia and New Zealand. Fewer cases have been reported in Latin America (including Mexico), Africa and Asia.

**Methods** This report was delivered during our national plastic surgery meeting in Cancun in May 2017. Before the meeting, two participants reviewed the literature. The review was performed using the following information sources: PubMed, Embase, Cochrane, Fisterra, Google Scholar and LILACS, with entries from 1980 to August

2015 in several languages (English, Spanish, French and Portuguese). The results were revealed during the meeting to the other participants. The consensus was divided into two parts. The first part included an open-ended question regarding the incidence and prevalence of the problem. The second part included clinical scenarios with different items that were rated by the participants. After this activity, accordance among the responses was evaluated.

**Results** Seven cases were reported during the meeting (3 from Mexico, 3 from Chile and 1 from Argentina). Fifty percent of the participants reported consulting with guidelines and clinical centers to help with potential cases. Most agreed that further studies must be done in cases of chronic seroma where the capsule plays an important role.

✉ Guillermo Ramos-Gallardo  
guiyermoramos@hotmail.com

<sup>1</sup> Asociación Mexicana de Cirugía Plástica Estética y Reconstructiva, Flamencos No. 74 esquina con Félix Parra Col. San José Insurgentes Delegación, 03900 Benito Juárez Distrito Federal, Mexico

<sup>2</sup> Sociedad Argentina de Cirugía Plástica Estética y Reconstructiva, Federación Iberolatinoamericana de Cirugía Plástica, Buenos Aires, Argentina

<sup>3</sup> Sociedad Chilena de Cirugía Plástica, Santiago, Chile

<sup>4</sup> Sociedad Colombiana de Cirugía Plástica Estética y Reconstructiva, Cartagena, Colombia

<sup>5</sup> Asociación Costarricense de Cirugía Plástica Estética y Reconstructiva, San José, Costa Rica

<sup>6</sup> Sociedad Dominicana de Cirugía Plástica Reconstructiva y Estética, Punta Cana, Dominican Republic

<sup>7</sup> Asociación Guatemalteca de Cirugía Plástica, Estética y Reconstructiva, Guatemala City, Guatemala

<sup>8</sup> Asociación Nicaragüense de Cirugía Plástica, Managua, Nicaragua

<sup>9</sup> Asociación Panameña de Cirugía Plástica Estética y Reconstructiva, Panama City, Panama

<sup>10</sup> Sociedad Paraguaya de Cirugía Plástica Estética y Reconstructiva, Asunción, Paraguay

<sup>11</sup> Sociedad Peruana de Cirugía Plástica Estética y Reconstructiva, Lima, Peru

<sup>12</sup> Sociedad Venezolana de Cirugía Plástica Estética, Reconstructiva y Maxilofacial, Caracas, Venezuela

**Discussion** A current debate exists about the incidence of this problem in Latin America because we did not report the same number of cases as Europe, Australia or North America. More studies are required to determine the differences among reports in Latin America.

**Conclusion** Most representatives agreed that further studies must be done. Concern is increasing, and the problem is known. Other factors involved may be considered, and the problem must not be ignored.

**No Level Assigned** This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors [www.springer.com/00266](http://www.springer.com/00266).

**Keywords** Breast implant · Anaplastic large cell lymphoma · ALCL · Adverse event

## Introduction

Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) should be suspected in any patient with breast implants and chronic seroma [1–4]. Most cases have been reported from North America, Europe or Oceania [5–7]. In Mexico and Latin America, there is a concern of this pathology.

We reported the first case in Latin America, which was a Mexican patient with a previous history of breast augmentation and liposuction 8 years before the appearance of breast asymmetry due to chronic seroma [8]. The diagnosis was confirmed by the pathologist after several samples without specific diagnoses. At that moment, we did not find any reports of BIA-ALCL from Central or South America.

Brazil and Mexico are important in the world market of texturized breast implants. For this reason, we organized a meeting with the presidents of different plastic surgery societies to discuss this pathology in the region.

## Methods

A consensus was achieved with representatives from different plastic surgery societies of the region during our national meeting in Cancun. We had representatives from Argentina, Chile, Colombia, Costa Rica, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic and Venezuela (Fig. 1).

Two participants reviewed the literature before the event. The review was performed using the following information sources: PubMed, Embase, Cochrane, Fistera, Google Scholar and LILACS. We evaluated articles

published from 1980 to August 2015, in several languages (English, Spanish, French and Portuguese).

The MESH language was used to identify keywords in our research. The following keywords were used: lymphoma or non-Hodgkin's lymphoma or anaplastic large cell lymphoma or ALCL or BIA-ALCL and breast implant or breast prostheses, breast implants or silicones or silicone gel and adverse effects. Article selection: Two researchers reviewed the publications and selected articles based on inclusion and exclusion criteria. The inclusion criteria were cases or a series of cases with at least six of the following variables: age, breast implants, time since implantation and onset of symptoms, implant brand, implant cover characteristics (texturized, non-texturized or polyurethane), biopsy or histopathological study that confirmed the lymphoma diagnosis, markers that were used to perform the diagnosis, surgical treatment, chemotherapy, radiotherapy, follow-up and mortality due to lymphoma associated with breast implants. The exclusion criteria were studies that provided incomplete information or duplicate data for their cases. The results were reported to the participants.

We divided the consensus into two parts. The first part consisted of an open-ended question:

1. Do you know any cases of BIA-ALCL in your country?
2. If the answer is yes, how many confirmed cases do you have?
3. In your country, do you use any medical guidelines to approach any possible cases of BIA-ALCL?
4. Do you have pathologists with enough experience to diagnose these cases in your country?
5. Do you have a reference center for any possible cases in your country?

The second part consisted of clinical scenarios, each scenario with questions and answers numbered from 1 to 10 with scores of 1–3 indicating disagreement, 4–7 uncertainty and 8–10 agreement. Each question had a final grade rating.

The main questions from the clinical scenarios were as follows:

1. At the time of removing or changing breast implants in an asymptomatic patient with chronic seroma, what is the importance of sending samples to laboratory and pathology? Nothing, culture, histochemistry, pap smear, pathology sample, markers.
2. A patient with history of breast implants (placed more than 1 year ago) comes to the clinic for an increase in breast tissue volume. What will be the clinical findings that you will investigate? Breast asymmetry, nodes, inflammation.



**Fig. 1** Banner of the event

3. In the same patient, what type of breast imaging will you propose? Nothing, ultrasound, CT scan, MRI.
4. What will be your treatment if fluid (seroma) is found in the studied breast? Wait for spontaneous resolution, antibiotic and anti-inflammatory drugs, puncture-guided surgical aspiration.
5. Once the fluid has been aspirated, what type of study will you order? Nothing, culture, pap smear, immunomarkers, immunohistochemistry.
6. Do you agree to order the following test to identify possible bacteria or biofilm? Sonication, normal culture, anaerobe culture, mycobacteria, PCR for mycobacteria.
7. If after seroma aspiration, the patient returns because of persistence of the problem, what will be your approach? Implant removal of the affected side, implant removal both sides, exchange implant, fluid aspiration, capsulectomy, nodes exploration.
8. What type of study will you order for the capsule? None, culture, histopathology, immunomarkers.
9. Once the implant is removed, what findings will you look for in the implant? Integrity, site of rupture, opacity, type of implant (silicone, saline), type of

coverage (smooth and texture), brand, timing of implantation.

10. In cases of suspected BIA-ALCL, in addition to the pathology report, what type of clinical findings will you record? Age, race, location of pocket, past history of drains, antibiotics, past history of seroma, type of incision.

## Results

In total, 172 publications were identified; according to the inclusion and exclusion criteria, information from 42 articles was discussed with the panelists [8–49] including representatives of plastic surgery societies from Argentina, Colombia, Costa Rica, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic and Venezuela.

Representatives from three societies confirmed at least one case of BIA-ALCL (Chile 3, Mexico 3 and Argentina 1). Fifty percent of the representatives reported that they would consult with a center to follow guidelines for approach and treatment. All participants were informed about the relationship between BIA-ALCL and chronic

**Table 1** Results of the second part of the study

	Disagree	Uncertain	Agree	
At the time to remove or exchange breast implants in asymptomatic patient, if additional finding is chronic seroma, what is the importance to send samples to laboratory and pathology?				
Nothing	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	1.53
Culture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.9
Histochemistry	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.5
Pap smear	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	6.6
Pathology	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.75
Markers	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8
If female with breast implant comes to clinic to evaluate increase in volume of breast tissue (implants were placed more than 1 year ago), what will be the clinical findings that you will search?				
Breast asymmetry	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.23
Nodes	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.52
Inflammation	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.62
In the same patient what type of breast image will you propose?				
Nothing	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	1.07
Ultrasound	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.5
CT scan	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	5.68
MRI	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.7
In the breast image study if the final report comes with fluid (seroma), what will be your treatment?				
Waiting expontaneous resolution	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	3.1
Antibiotic and anti-inflammatory	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	5.9
Puncture guided	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	6.2
Surgical aspiration	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.4
Once the fluid has been aspirated, what type of study will you order?				
Nothing	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	2.25
Culture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.83
Pap smear	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.72
Immunomarkers	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.33
Immunohistochemistry	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.89
Do you agree to order the following test to identify possible bacteria or biofilm?				
Sonication	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	4.5
Normal culture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.1
Anaerobes culture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.18
Mycobacteria	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.46
PCR for mycobacteria	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7
If after seroma aspiration patient came back with persistence of the problem, what will be your approach?				
Repeat treatment	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	3.1
Consult oncology	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	6.8
Implant removal of the affected side	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.58
Implant removal both sides	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.94
Exchange implant	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	5.76
Fluid aspiration	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.6
Capsulectomy	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.05
Nodes exploration	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	6.5
What type of study will you order to the capsule? None, culture, histopathology, immunomarkers				
None	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	2.25
Culture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.83
Histopathology	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.72

**Table 1** continued

	Disagree	Uncertain	Agree	
Immunomarkers	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.33
Histochemistry	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.89
Once the implant is removed, what type of findings will you be looking for in the implant?				
Integrity	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.38
Site of rupture	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.35
Opacity	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.76
Type of implant (silicone or saline)	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.94
Type of coverage (smooth or texture)	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.38
Brand	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.47
Timing implantation	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.7
In case of possible case of lymphoma additional to the pathology report, what type of clinical findings will you register?				
Age	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	7.88
Race	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.72
Pocket location	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.27
Type of incision	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.31
Use of drains	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.31
Antibiotic	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	8.15
Past history of seroma	(1) (2) (3)	(4) (5) (6) (7)	(8) (9) (10)	9.57

seroma. The subject has been discussed in the meetings in the region.

Table 1 shows the results of the second part of the study.

## Discussion

BIA-ALCL is a rare malignancy arising in an effusion or capsule in breast prosthesis.

The causes of this pathology are debatable and include, for example, biofilm due to bacteria, the surface of the implant or a possible genetic predisposition. [17, 25, 50, 51]. This condition drew our attention because in South America, we observed more reports than those in other countries with smaller populations. It is true that some authorities play an important role in recording cases and providing important information about this pathology, and some others work in close contact with different societies [5]. Specifically, in Mexico, we have organized sessions, meeting and guidelines because we represent an important market for texture implants, and we only have information from three cases, the first of which was reported to the companies 2 years ago [8].

Since the first report, we have seen an increase in the information about this matter [52]. More recent studies in our population will help to clarify the possible causes, including the genetic or demographic factors that may play a role in this pathology. We are working together with other plastic surgery societies including the Global

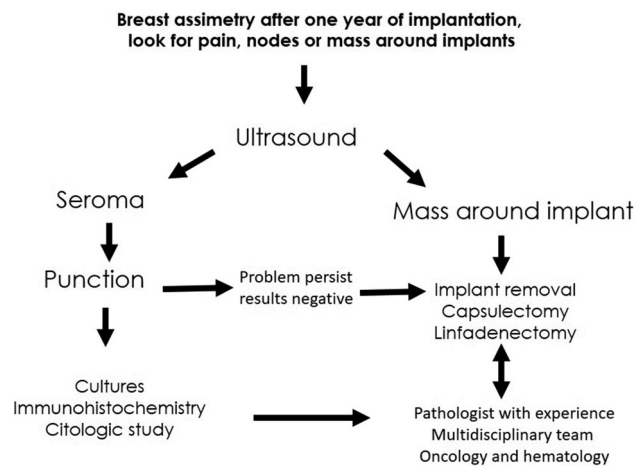
Network of BIA-ALCL. This is a group of experts from different parts of the world who are joining efforts, knowledge and experience in this subject. As mentioned by Clemens and colleagues, it is extremely important to mention the possibility of this problem in the informed consent [53].

We have instructed plastic surgeons to be aware about the possibility of chronic seroma in any patient with breast asymmetry after 1 year of implantation. Additional findings including nodes, contracture and masses should also be determined [1–4].

It is important to mention that not all the cases of chronic seroma are ALCL, but the most common symptom of ALCL is chronic seroma [54] [56] (Fig. 2). The cases that we know of from our region were diagnosed by persistence of the seroma and high suspicion from the plastic surgeon. Our suggestion in the case of chronic seroma is to take a sample by puncture-guided ultrasound and to work with an experienced pathologist. In cases of high suspicion even after a negative result, we should consider bilateral removal and capsulectomy to help make diagnoses and guide important steps in treatment.

Most of the information comes from other countries, and we are aware of this, so we are making an effort to join all the possible cases with the same group of specialists to provide the same treatment. We should not forget that cancer treatment has changed in recent years. New biological treatments have come into the field [55].

Traditionally, surgery has been the key treatment of many cancers, for example, breast cancer. Currently, new



**Fig. 2** Algorithm for the management of chronic seroma in patients with breast implants. Chronic seroma is defined as one that occurs after 1 year from the placement of breast implants

treatments have come into use. Specific markers, such as Her2, have become important, and trastuzumab has become one of the main treatments in the field [56]. Brentuximab has become a new option to treat BIA-ALCL, and for this reason, it is very important that every society, medical authority and country has a pathologist capable of confirming diagnoses using proper markers such as CD30 and ALK. Immunology is receiving more attention as a promising treatment option to help patients with advanced stage cancer.

BIA-ALCL is not as common as breast cancer, and for this reason, we encourage that in any suspected case of BIA-ALCL, the patient should be oriented to a multidisciplinary treatment approach where the plastic surgeon can help to make right diagnosis [57]. We have seen that it is not common for the pathologist to study this problem. In South and Central America, we know that pathologists are not familiar, so if the problem persists (seroma), we can collaborate to rule out this entity. In Mexico, it was necessary to take more than one sample to rule out this problem in the first case. We also know this is not the same problem as there is in other countries at this moment.

The topic seems to be popular in social media and the news. We need to be careful how we handle this problem and how we inform our patients.

## Conclusion

BIA-ALCL is receiving increased attention among different societies in the region. More efforts to create a multidisciplinary team will improve awareness of this problem. All participants agreed that the manner in which chronic

seroma is approached needs to be changed, and efforts to consult with a multidisciplinary team will help to make the correct diagnoses and treatment.

**Acknowledgements** We want to acknowledge the great effort of Dr. María del Mar Vaquero Pérez. She has contributed to the study of this pathology in the region. She collaborates with different plastic surgery societies in the region. She is an enthusiastic and cooperative surgeon that always offers help to the members of the FILACP (Federación IberoLatinoamericana de Cirugía Plástica). She is an active member of the FILACP and the Sociedad Española de Cirugía Plástica Reparadora y Estética (SECPRE). We want to recognize the work of Rufino Iribarren Moreno, Ernesto Theurel Sangeado and Marco Antonio Kalixto Sánchez if favor of the Safety of the Plastic Surgery. He works has done a lot in favor of the patients.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

## References

- Ramos-Gallardo G, Cuenca-Pardo J, Rodríguez-Olivares E, Iribarren-Moreno R, Contrera-Bulnes L, Vallarta-Rodríguez A, Kalixto-Sanchez M et al (2017) Breast implant and anaplastic large cell lymphoma meta-analysis. *J Invest Surg* 30(1):56–65
- Gidengil CA, Predmore Z, Mattke S, Busum KV, Kim B (2015) Breast implant-associated anaplastic large-cell lymphoma: a systematic review. *Plast Reconstr Surg* 135(3):713–720
- Miranda RN, Aladily TN, Princ MH, Kanagal-Shamanna R, de Jong D, Fayad LE et al (2014) Breast implant-associated anaplastic large cell lymphoma: long term follow up of 60 patients. *J Clin Oncol* 32(2):114–120
- Wilkinson AL, Beath KJ, Clemens MW, Brody GS, Mahabir RC, Miranda RN (2018) How to diagnose and treat breast implant-associated anaplastic large cell lymphoma. *Plast Reconstr Surg* 141(4):586–599
- Srinivasa DR, Miranda RN, Kaura A, Francis AM, Campanale A, Boldrini R, Alexander J, Deva AK, Gravina PR, Medeiros LJ, Nast K, Butler CE, Clemens MW (2017) Global adverse event reports of breast implant-associated ALCL: an international review of 40 government authority databases. *Plast Reconstr Surg*. 139(5):1029–1039
- William RJ, Wessels WL, Magnusson M, Papadopoulos T (2017) Breast implant-associated anaplastic large cell lymphoma in Australia and New Zealand: high surface area texture implants are associated with increased risk. *Plast Reconstr Surg* 140(4):645–654
- Campanale A, Boldrini R, Marletta M (2018) 22 cases of breast implant associated ALCL: awareness and outcome tracking from the Italian Ministry of Health. *Plast Reconstr Surg* 141(1):11e–19e
- Torres-Rivero C, Ramos-Gallardo G, Nambo-Lucio MJ, Vaquero-Pérez MM (2016) Primer caso en México y América Latina de linfoma anaplásico de células gigantes en pacientes con implantes mamarios. *Cirugía Plástica Ibero-Latinoamericana* 42(2):175–180
- Keech JA Jr, Creech BJ (1997) Anaplastic T-cell lymphoma in proximity to a saline-filled breast implant. *Plast Reconstr Surg* 100(2):554–555
- Gaudet G, Friedberg JW, Weng A, Pinkus GS, Freedman AS (2002) Breast Lymphoma associated with breast implants: two

- case reports and a review of the literature. *Leuk Lymphoma* 43(1):115–119
11. Sahoo S, Rosen PP, Feddersen RM, Viswanatha DS, Clark DA, Chadburn A (2003) Anaplastic large cell lymphoma arising in a silicone breast implant capsule: a case report and review of the literature. *Arch Pathol Lab Med* 127(3):e115–e118
  12. Kraemer DM, Tony HP, Gattenlöhner S, Müller JG (2003) Lymphoplasmacytic lymphoma in a patient with leaking silicone implant. *Haematologica* 88(9):30
  13. Fritzsche FR, Pahl S, Petersen I, Burkhardt M, Dankof A, Diel M, Kristiansen G (2006) Anaplastic large-cell non-Hodgkin's lymphoma of the breast in periprosthetic localisation 32 years after treatment for primary breast cancer—a case report. *Virchows Arch* 449(5):561–564
  14. Olack B, Gupta R, Brooks GS (2007) Anaplastic large cell lymphoma arising in a saline breast implant capsule after tissue expander breast reconstruction. *Ann Plast Surg* 59(1):56–57
  15. Newman MK, Zimmel NJ, Bandak AZ, Kaplan BJ (2008) Primary breast lymphoma in a patient with silicone breast implants: a case report and review of the literature. *J Plast Reconstr Aesthet Surg* 61(7):822–825
  16. Wong AK, Lopategui J, Clancy S, Kulber D, Bose S (2008) Anaplastic large cell lymphoma associated with a breast implant capsule: a case report and review of the literature. *Am J Surg Pathol* 32(8):1265–1268
  17. de Jong D, Vasmel WL, de Boer JP, Verhave G, Barbé E, Casparie MK, van Leeuwen FE (2008) Anaplastic large-cell lymphoma in women with breast implants. *JAMA* 300(17):2030–2035
  18. Roden AC, Macon WR, Keeney GL, Myers JL, Feldman AL, Dogan A (2008) Seroma associated primary anaplastic large-cell lymphoma adjacent to breast implants: an indolent T-cell lymphoproliferative disorder. *Mod Pathol* 21(4):455–463
  19. Bishara MR, Ross C, Sur M (2009) Primary anaplastic large cell lymphoma of the breast arising in reconstruction mammoplasty capsule of saline filled breast implant after radical mastectomy for breast cancer: an unusual case presentation. *Diagn Pathol* 2:4–11
  20. Miranda RN, Lin L, Talwalkar SS, Manning JT, Medeiros LJ (2009) Anaplastic large cell lymphoma involving the breast: a clinicopathologic study of 6 cases and review of the literature. *Arch Pathol Lab Med* 133(9):1383–1390
  21. Lee K (2010) Silicone implant and primary breast ALK1-negative anaplastic large cell lymphoma, fact or fiction? *Int J Clin Exp Pathol* 3(1):117–127
  22. Do V, Shifrin DA, Oostendorp L (2010) Lymphoma of the breast capsule in a silicone implant-reconstructed patient. *Am Surg* 76(9):1030–1031
  23. Lechner MG, Lade S, Liebertz DJ, Prince HM, Brody GS, Webster HR, Epstein AL (2011) Breast implant-associated, ALK-negative, T-cell, anaplastic, large-cell lymphoma: establishment and characterization of a model cell line (TLBR-1) for this newly emerging clinical entity. *Cancer* 117(7):1478–1489
  24. Carty MJ, Pribaz JJ, Antin JH, Volpicelli ER, Toomey CE, Farkash EA, Hochberg EP (2011) A patient death attributable to implant-related primary anaplastic large cell lymphoma of the breast. *Plast Reconstr Surg* 128(3):112e–118e
  25. Popplewell L, Thomas SH, Huang Q, Chang KL, Forman SJ (2011) Primary anaplastic large-cell lymphoma associated with breast implants. *Leuk Lymphoma* 52(8):1481–1487
  26. Rajabiani A, Arab H, Emami A, Manafi A, Bazzaz N, Saffar H (2012) Anaplastic large cell lymphoma associated with breast implant: a case report. *World J Plast Surg* 1(1):46–50
  27. Smith TJ, Ramsaroop R (2012) Breast implant related anaplastic large cell lymphoma presenting as late onset peri-implant effusion. *Breast* 21(1):102–104
  28. Ravi-Kumar S, Sanaei O, Vasef M, Rabinowitz I, Fekrazad MH (2012) Anaplastic large cell lymphoma associated with breast implants. *World J Plast Surg* 1(1):30–35
  29. Taylor KO, Webster HR, Prince HM (2012) Anaplastic large cell lymphoma and breast implants: five Australian cases. *PRS* 129(4):610e–617e
  30. Aladily TN, Medeiros LJ, Amin MB, Haideri N, Ye D, Azevedo SJ, Jorgensen JL, de Peralta-Venturina M, Mustafa EB, Young KH, You MJ, Fayad LE, Blenc AM, Miranda RN (2012) Anaplastic large cell lymphoma associated with breast implants: a report of 13 cases. *Am J Surg Pathol* 36(7):1000–1008
  31. Arbelaez A, Catley L, Pool L (2013) breast implant related anaplastic large cell lymphoma ALK-(ALCL ALK-)—case report. *Blood* 122(21):5086
  32. De Silva IM, Teague JA, Blake WE (2013) Breast implant associated anaplastic large cell lymphoma: a case report and reconstructive option. *J Plast Reconstr Aesthet Surg* 66(12):1773–1776
  33. Parthasarathy M, Orrell J, Mortimer C, Ball L (2013) Chemotherapy-resistant breast implant-associated anaplastic large cell lymphoma. *BMJ Case Rep.* <https://doi.org/10.1136/bcr-2013-201950>
  34. de Torres Olombrada M, García T, Caballero P, Sotoca A, Ludeña B, Caballero B, Rodríguez A, Bravo P, Lopez A (2013) Anaplastic large cell lymphoma associated with breast implant: a case report and review of the literature. *Arch Pathol Lab Med* 18:S275–S276
  35. Farace F, Bulla A, Marongiu F, Campus GV, Tanda F, Lissia A, Cossu A, Fozza C, Rubino C (2013) Anaplastic large cell lymphoma of the breast arising around mammary implant capsule: an Italian report. *Aesthetic Plast Surg* 37(3):567–571
  36. Singh E, Frost E, Morris EJ, Raza S (2013) Anaplastic lymphoma masquerading as breast abscess in a patient with silicone implants. *Breast J* 19(5):543–545
  37. Bautista-Quach MA, Nademane A, Weisenburger DD, Chen W, Kim YS (2013) Implant-associated primary anaplastic large-cell lymphoma with simultaneous involvement of bilateral breast capsules. *Clin Breast Cancer* 13(6):492–495
  38. George EV, Pharm J, Houston C, Al-Quran S, Brian G, Dong H, Hai W, Reeves W, Yang LJ (2013) Breast implant-associated ALK-negative anaplastic large cell lymphoma: a case report and discussion of possible pathogenesis. *Int J Clin Exp Pathol* 16(8):1631–1642
  39. Ivaldi C, Perchenet AS, Jallut Y, Casanova D (2013) Two cases of lymphoma in an implant capsule: a difficult diagnosis, an unknown pathology. *Ann Chir Plast Esthet* 58(6):688–693
  40. Weathers WM, Wolfswinkel E, Hatfeg DA, Lee E, Hollier LH, Brown Rh (2013) Implant-associated anaplastic large cell lymphoma of the breast: insight into a poorly understood disease. *Can J Plast Surg* 21(2):95–98
  41. Sørensen K, Murphy J, Lennard A, Wadehra V, Menon GK, Collis N (2014) Anaplastic large cell lymphoma in a reconstructed breast using a silicone implant: a UK case report. *J Plast Reconstr Aesthet Surg* 67(4):561–563
  42. Talagas M, Uguen A, Charles-Petillon F, Conan-Charlet V, Marion V, Hu W, Amice J, De Braekeleer M (2014) Breast implant-associated anaplastic large-cell lymphoma can be a diagnostic challenge for pathologists. *Acta Cytol* 58(1):103–107
  43. Hart AM, Lechowicz MJ, Peters KK, Holden J, Carlson GW (2014) Breast implant-associated anaplastic large cell lymphoma: report of 2 cases and review of the literature. *Aesthet Surg J* 34(6):884–894
  44. Hwang MJ, Brown H, Murrin R, Momtahan N, Sterne GD (2015) Breast implant-associated anaplastic large cell lymphoma: a case report and literature review. *Aesthetic Plast Surg* 39(3):391–395

45. Tardío JC, Granados R (2015) Axillary lymphadenopathy: an outstanding presentation for breast implant-associated ALK-negative anaplastic large cell lymphoma. *Int J Surg Pathol* 23(5):424–428
46. Henry AS, Kerfant N, Blanc C, Trimaille A, Costa S, Hu W (2015) Anaplastic large cell lymphoma after breast prosthesis removal: about a case. *Ann Chir Plast Esthet* 60(1):70–73
47. Estes C, Zhang D, Reyes R, Korentager R, McGinness M, Lominska C (2015) Locally advanced breast implanted-associated anaplastic large-cell lymphoma: a case report of successful treatment with radiation and chemotherapy. *Front Oncol* 5:1–4
48. Locke MB, Lofts J (2015) Variable presentation of anaplastic large-cell lymphoma in patients with breast implants. *ANZ J Surg* 87(10):789–794
49. Santanelli di Pompeo F, Laporta R, Sorotos M, Di Napoli A, Giovagnoli MR, Cox MC, Campanale A, Longo B (2015) Breast implants associated anaplastic large cell lymphoma: proposal for monitoring protocol. *Plast Reconst Surg* 136(2):144e–151e
50. Largent J, Oefelein M, Kaplan HM (2012) Risk of lymphoma in women with breast implants: analysis of clinical studies. *Eur J Cancer Prev* 21(3):274–280
51. Boer MB, Leeuwen FE, Hauptmann M, Overbeek LH, de Boer JP, Mijmering NJ et al (2018) Breast implants and the risk of anaplastic large-cell lymphoma in the breast. *JAMA Oncol* 4(3):335–341
52. Keech JA Jr, Creech BJ (1997) Anaplastic T-cell lymphoma in proximity to a saline-filled breast implant. *PRS* 100(2):554–555
53. Clemens MW, Miranda RN, Butler CE (2016) Breast implant informed consent should include the risk of anaplastic large cell lymphoma. *Plast Reconstr Surg* 137(4):1117–1122
54. Ramos-Gallardo G (2016) How I can suspect of mycobacteria infection in breast implant surgery. *World J Plast Surg* 3(3):1–5
55. Alderuccio JP, Desai Am Yepes MM, Chapman JR, Vega F, Lossos IS (2018) Frontline brentuximab vedotin in breast implant-associated anaplastic large-cell lymphoma. *Clin Case Rep* 6(4):634–637. <https://doi.org/10.1002/ccr3.1382>
56. Fleming D, Stone J, Tansley P (2018) Spontaneous regression and resolution of breast implant-associated anaplastic large cell lymphoma: implications for research, diagnosis and clinical management. *Aesth Plast Surg*. <https://doi.org/10.1007/s00266-017-1064-z>
57. Clemens MW, Brody CS, Mahabir RC, Miranda RN (2018) How to diagnose and treat breast implant-associated anaplastic large cell lymphoma. *Plast Reconst Surg*. 141(4):586e–599e