

Anaplastic Large Cell Lymphoma, ALK-Negative: A Rare Case with Histopathological and Immunohistochemical Features

Bilal Ramez Bakri ¹, Camila Machado Baldavira ², William Marques Pirani ¹, Alexandre Ab'Saber ², Vera Luiza Capelozzi ^{2,*}

¹ Biomega Laboratory, Barueri, São Paulo, Brazil.

² Department of Pathology, Faculty of Medicine, University of São Paulo, São Paulo, São Paulo, Brazil.

* Correspondence: vera.capelozzi@fm.usp.br.

Abstract: We report a case of anaplastic large cell lymphoma (ALCL), ALK-negative, diagnosed in a 27-year-old patient presenting with diffuse lymphadenopathy and constitutional symptoms. Histopathological examination revealed sheets of large pleomorphic lymphoid cells, and immunohistochemistry demonstrated CD30 positivity with ALK negativity. This case highlights the diagnostic and therapeutic challenges associated with this rare subtype of T-cell lymphoma and contributes to the growing body of literature on ALCL ALK-negative.

Keywords: Lymphoma, Large-Cell, Anaplastic; Pathology; Differential Diagnosis.

Citation: Bakri BR, Baldavira CM, Pirani WM, Ab'Saber A, Capelozzi VL. Anaplastic Large Cell Lymphoma, ALK-Negative: A Rare Case with Histopathological and Immunohistochemical Features. *Brazilian Journal of Case Reports*. 2026 Jan-Dec;06(1):bjcr124.

<https://doi.org/10.52600/2163-583X.bjcr.2026.6.1.bjcr124>

Received: 21 August 2025

Accepted: 15 September 2025

Published: 9 October 2025



Copyright: This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

1. Introduction

Anaplastic large cell lymphoma (ALCL) is a rare and aggressive subtype of non-Hodgkin's lymphoma that belongs to the broader spectrum of mature T-cell and natural killer (NK)-cell neoplasms [1]. It accounts for approximately 2-3% of all non-Hodgkin lymphomas, with its hallmark being the expression of the cell surface marker CD30 [2]. ALCL is clinically significant due to its aggressive behavior, potential for systemic involvement, and varied presentation, making it a challenge both in diagnosis and treatment.

ALCL is typically divided into two subtypes: ALK-positive and ALK-negative, based on the presence or absence of anaplastic lymphoma kinase (ALK) expression. The ALK gene is located on chromosome 2 and encodes a receptor tyrosine kinase. ALK-positive ALCL is driven by chromosomal translocations involving the ALK gene, with the most common translocation being t(2;5)(p23;q35), resulting in the formation of an ALK fusion protein. This abnormal fusion protein plays a crucial role in promoting tumorigenesis through the activation of signaling pathways involved in cell survival and proliferation [3,4]. On the other hand, ALK-negative ALCL, which lacks these translocations and ALK expression, tends to have a more heterogeneous molecular profile, with mutations and genetic alterations in other pathways, including the JAK-STAT signaling pathway, playing an important role in disease progression [5,6].

ALK-negative ALCL is less common, accounting for 40-50% of all ALCL cases, and is generally considered to have a more unfavorable prognosis compared to its ALK-positive counterpart [7]. Clinically, ALCL ALK-negative tends to present in older patients, with a more frequent involvement of extranodal sites, including the skin, lungs, and soft tissues, and can be associated with systemic symptoms such as fever, weight loss, and night sweats [1,2]. Pathologically, ALCL ALK-negative is characterized by pleomorphic

large cells with irregular nuclei, prominent nucleoli, and abundant eosinophilic cytoplasm. Multinucleated giant cells and a high proliferative index are often observed. Immunohistochemically, the tumor cells are positive for CD30 and EMA but lack expression of ALK, which differentiates it from ALK-positive ALCL [2].

The molecular profile of ALCL ALK-negative is more complex and varies from case to case. In addition to the absence of ALK expression, ALCL ALK-negative cases can exhibit rearrangements of other genes, including DUSP22, TP63, and IRF4, which may have prognostic implications [6,7]. However, the identification of specific genetic alterations is not yet fully standardized, and the molecular mechanisms underlying ALCL ALK-negative remain an area of active investigation. Given its rarity and clinical aggressiveness, ALCL ALK-negative poses a diagnostic challenge, as it shares similarities with other CD30-positive malignancies, including classical Hodgkin lymphoma, peripheral T-cell lymphoma, and other T-cell lymphomas. These overlapping features underscore the importance of a comprehensive histological, immunohistochemical, and molecular approach to accurately diagnose ALCL ALK-negative and differentiate it from other entities within the T-cell lymphoma spectrum [8,9].

Considering the characteristics of ALK-negative ALCL, we present an atypical case involving a 27-year-old patient with this condition. This report includes detailed histopathological, immunohistochemical, and molecular findings, along with information on clinical follow-up and therapeutic responses. Our goal in presenting this case is to contribute to the growing body of literature on the prognostic variability of ALK-negative ALCL. We also aim to highlight the diagnostic challenges posed by its diverse morphological spectrum and discuss the role of molecular testing and novel therapies in guiding clinical management.

2. Case Report

2.1 Clinical Presentation

A 27-year-old male presented with generalized lymphadenopathy, fatigue, and unintentional weight loss over three months. Physical examination revealed multiple enlarged, non-tender cervical, axillary, and inguinal lymph nodes. Laboratory findings included pancytopenia and elevated lactate dehydrogenase (LDH). No significant hepatosplenomegaly was noted on imaging studies.

2.2 Histopathological Findings

Excisional biopsy of an axillary lymph node was performed. Hematoxylin and eosin (H&E) staining revealed effacement of normal nodal architecture. Sheets of large pleomorphic lymphoid cells with irregular nuclei, prominent nucleoli, and abundant eosinophilic cytoplasm. Scattered multinucleated giant cells (Figure 1). The tumor cells were positive for the following markers: CD30 (strong and diffuse membranous and cytoplasmic staining) and EMA. Negative for: ALK, confirming the diagnosis of ALK-negative ALCL and CD3 and CD20, indicative of T-cell lineage and excluding B-cell neoplasms (Figure 2). Other markers included PAX5 (negative, ruling out classical Hodgkin lymphoma). Ki-67 demonstrated high proliferation index (~80%).

2.3 Additional Studies

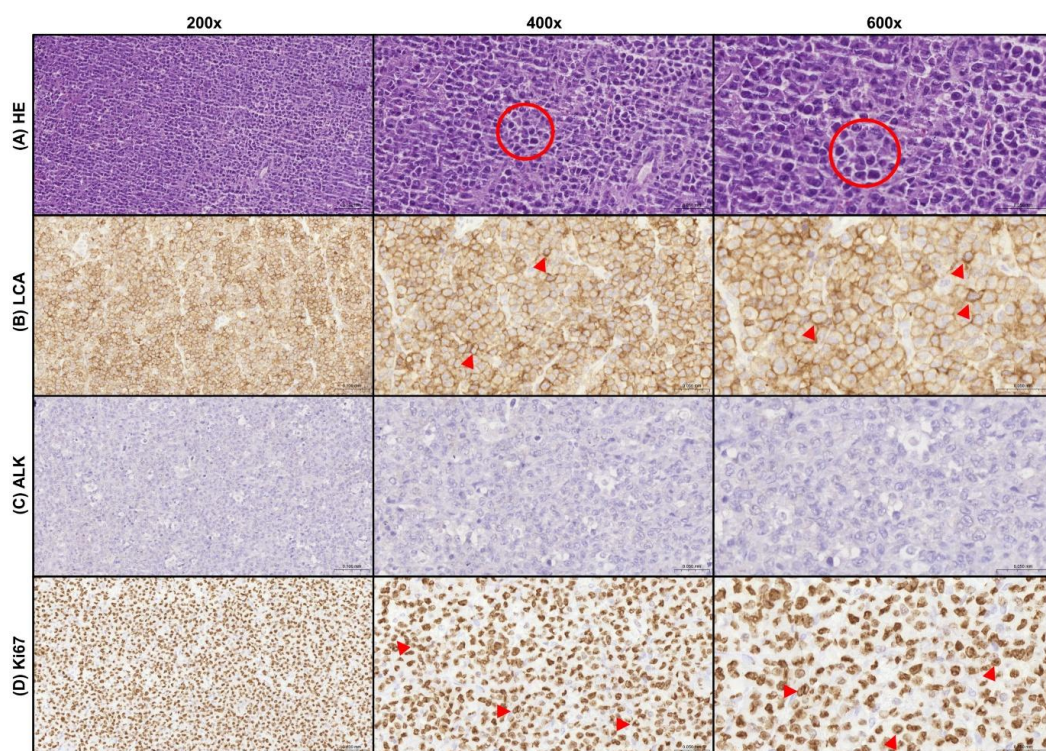
Molecular studies were negative for DUSP22 and TP63 rearrangements. No MYC or BCL2 translocations were identified.

2.4 Follow-Up and Outcomes

After being diagnosed with ALK-negative ALCL, the patient began first-line therapy with CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone). After two cycles, a partial response was noted; however, there was residual lymphadenopathy and

ongoing systemic symptoms. Due to this suboptimal response, the treatment was escalated to include brentuximab vedotin in combination with chemotherapy. After four cycles, the patient achieved a complete metabolic response on PET/CT, which was maintained at the end of treatment.

Figure 1. Histological Features of ALK-negative Anaplastic Large Cell Lymphoma. In the panel (A), the H&E staining shows large atypical lymphoid cells with irregular nuclei, prominent nucleoli, and abundant cytoplasm characteristic of ALK-negative ALCL. The high magnification of the same sample highlights the pleomorphic nature of the tumor cells, with a scattered inflammatory infiltrate of small lymphocytes. In (B), the immunohistochemistry for LCA positivity in the neoplastic cells, confirms the diagnosis of lymphoma. In (C), immunohistochemistry demonstrates the absence of ALK protein in the tumor cells, supporting the ALK-negative subtype of ALCL. In panel (D), the Immunohistochemistry demonstrates the high proliferation index of Ki67 nuclear expression in the tumor cells. Magnification: 200x, 400x, and 600x; respectively. Scale: 0.1 mm, 0.05 mm, and 0.05 mm; respectively.



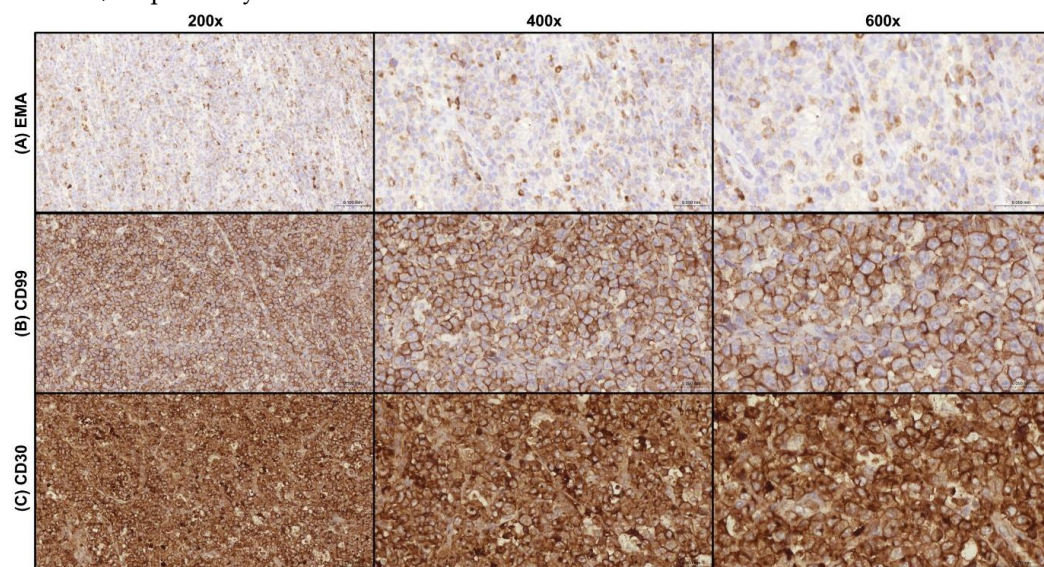
At the 12-month follow-up, the patient remained in complete remission, with no clinical or radiological signs of disease recurrence. Routine imaging and laboratory tests showed no abnormalities. The patient is currently under regular follow-up in the hematology clinic.

3. Discussion

3.1 Overview

Anaplastic large cell lymphoma (ALCL) is a rare and aggressive subtype of non-Hodgkin's lymphoma that belongs to the broader spectrum of mature T-cell and natural killer (NK)-cell neoplasms [1]. It accounts for approximately 2-3% of all non-Hodgkin lymphomas, with its hallmark being the expression of the cell surface marker CD30 [2,4]. ALCL is clinically significant due to its aggressive behavior, potential for systemic involvement, and varied presentation, making it a challenge both in diagnosis and treatment.

Figure 2. Immunophenotypic Profile of ALK-negative Anaplastic Large Cell Lymphoma. Panel (A), the immunohistochemistry showing strong membranous positivity for EMA (Epithelial Membrane Antigen) in the neoplastic cells, which is commonly observed in ALK-negative ALCL, indicating epithelial-like differentiation in a subset of tumor cells. This feature is relatively common in ALK-negative ALCL and may lead to diagnostic confusion with carcinoma or other epithelioid neoplasms. In (B), immunohistochemistry for CD99 demonstrates focal positivity in tumor cells. CD99 expression may be seen in ALCL, although it is not a definitive diagnostic marker, as can also be expressed in other T-cell lymphomas and mesenchymal tumors. In panel (C), CD30 staining shows a diffuse and strong membrane positivity in the neoplastic cells, a hallmark feature of ALK-negative ALCL, confirming the presence of large atypical lymphoid cells with activated T-cell markers. Magnification: 200x, 400x, and 600x; respectively. Scale: 0.1 mm, 0.05 mm, and 0.05 mm; respectively.



3.2 Difference between ALCL ALK-Positive and ALK-Negative

ALCL is typically divided into two subtypes: ALK-positive and ALK-negative, based on the presence or absence of anaplastic lymphoma kinase (ALK) expression. The ALK gene is located on chromosome 2 and encodes a receptor tyrosine kinase. ALK-positive ALCL is driven by chromosomal translocations involving the ALK gene, with the most common translocation being $t(2;5)(p23;q35)$, resulting in the formation of an ALK fusion protein. This abnormal fusion protein plays a crucial role in promoting tumorigenesis through the activation of signaling pathways involved in cell survival and proliferation [3,4]. On the other hand, ALK-negative ALCL, which lacks these translocations and ALK expression, tends to have a more heterogeneous molecular profile, with mutations and genetic alterations in other pathways, including the JAK-STAT signaling pathway, playing an important role in disease progression [5,6].

Recent multicenter studies have confirmed that patients with ALK-positive ALCL experience significantly better response rates and overall survival than those with ALK-negative ALCL. For instance, the response to first-line anthracycline-based chemotherapy is approximately 88% in ALK-positive patients, compared to 76% in ALK-negative patients. Furthermore, the 5-year overall survival (OS) rates are 70%-80% for ALK-positive cases versus 40%-60% for ALK-negative cases, and the progression-free survival (PFS) rates are 60% and 36%, respectively [10,11]. Clinically, patients with ALK-negative ALCL are typically older and often present at advanced stages (III-IV) of the disease. They usually have higher International Prognostic Index (IPI) scores, exhibit B symptoms, and show elevated levels of $\beta 2$ -microglobulin, all of which are associated with a poorer prognosis [11]. In contrast, ALK-positive ALCL activates survival pathways such as STAT3

and AKT, along with anti-apoptotic signaling, which paradoxically enhances chemosensitivity. This partly explains why patients with ALK-positive ALCL generally respond better to standard therapy.

Considering the pathological characteristics of the ALCL ALK-negative is by the presence of pleomorphic large cells with irregular nuclei, prominent nucleoli, and abundant eosinophilic cytoplasm. Multinucleated giant cells and a high proliferative index are commonly observed in these tumors. Additionally, ALK-negative ALCL often shows epithelioid or cohesive growth patterns that can mimic epithelial differentiation. This pseudo differentiation does not indicate any true lineage commitment but reflects the morphological variability of the neoplastic T cells. These characteristics are clinically significant in differential diagnosis, as the condition may be mistaken for metastatic carcinoma or other epithelioid malignancies. Thus, the immunohistochemical analysis is crucial, as ALK-negative ALCL tumor cells are positive for CD30 and EMA but do not express ALK [2]. This distinction is important for differentiating it from ALK-positive ALCL. Furthermore, using additional immunohistochemical markers, such as cytotoxic markers, PAX5, and cytokeratins, can aid in establishing the correct diagnosis compared to other neoplasms.

The molecular profile of ALK-negative ALCL is complex and varies significantly from case to case, making it quite heterogeneous. This heterogeneity directly impacts prognosis, which differs according to molecular subgroups. ALK-negative ALCL cases may show rearrangements of various genes, including DUSP22, TP63, and IRF4, each of which can have prognostic implications [7]. For instance, patients with DUSP22 rearrangements typically have excellent outcomes, with approximately 90% achieving a 5-year overall survival rate, like that of patients with ALK-positive disease. In contrast, patients with TP63 rearrangements experience unfavorable survival rates, with only about 17% achieving a 5-year overall survival rate. Additionally, "triple-negative" cases, which lack ALK, DUSP22, and TP63 rearrangements, have intermediate outcomes, with around 42% achieving a 5-year overall survival rate [3,12]. Despite these findings, the identification of specific genetic alterations is not yet fully standardized, and the molecular mechanisms underlying ALK-negative ALCL remain an area of active research.

3.3 Differential Diagnosis challenges

Due to its rarity and clinical aggressiveness, ALCL ALK-negative presents a diagnostic challenge as it shares similarities with other CD30-positive malignancies, including classical Hodgkin lymphoma (cHL), peripheral T-cell lymphoma, and various other T-cell lymphomas [13]. Morphologically, ALK-negative ALCL may resemble cHL, particularly in cases with extensive nodal involvement, large anaplastic cells, or a mixed inflammatory background. Therefore, immunohistochemistry is crucial for differentiation: ALK-negative ALCL is typically PAX5-negative (unlike cHL), strongly CD30-positive, and often expresses cytotoxic markers such as TIA-1, granzyme B, and perforin. In contrast, cHL exhibits weak PAX5 positivity, CD15 positivity, and variable CD30 expression [14].

Additionally, molecular tools can be used as ancillary employed to clarify these distinctions. Techniques include fluorescence in situ hybridization (FISH) to detect rearrangements of ALK (confirming ALK-positive ALCL), as well as DUSP22 and TP63 rearrangements in ALK-negative ALCL. T-cell receptor (TCR) gene rearrangement analysis can demonstrate the clonality of T-cell lineage, supporting the diagnosis of ALCL versus B-cell malignancies. Gene expression profiling (GEP) can further help distinguish ALCL from cHL or peripheral T-cell lymphoma, not otherwise specified (PTCL-NOS). Next-generation sequencing (NGS) panels can identify recurrent mutations in pathways relevant to ALK-negative ALCL, including STAT3 and JAK1. Lastly, EBV-encoded RNA (EBER) in situ hybridization can aid in differentiating EBV-positive lymphoproliferative disorders from ALCL in atypical cases [14,15].

When combined with morphological observations and immunohistochemistry, these diagnostic tools enhance accuracy, particularly in small biopsies or atypical presentations.

Accurate diagnosis is critical, as treatment strategies and prognoses vary significantly among ALK-negative ALCL, cHL, and other CD30-positive lymphomas. However, it's important to note that these molecular tools are not always available at pathology evaluation centers. Therefore, a thorough histological and immunohistochemical assessment is fundamental for accurate patient diagnosis.

3.4 Therapeutic Options and Prognosis

The standard treatment for ALCL is CHOP, which consists of cyclophosphamide, doxorubicin, vincristine, and prednisone. The outcomes are significantly better for ALK-positive cases, with real-world studies showing a 5-year OS rate of approximately 82% compared to 44% for ALK-negative patients [3,16]. Targeted therapies, such as brentuximab vedotin, a monoclonal antibody linked to a cytotoxic drug, have shown promising results in CD30-positive lymphomas, including ALCL in ALK-negative patients [17]. Additionally, some evidence suggests that combining etoposide with CHOP may improve survival rates for ALK-negative patients [3,16].

For those with relapsed or refractory disease, it has indicated that brentuximab vedotin can achieve response rates as high as 86% in patients with ALCL and a complete remission (CR) rate of 57% among patients with relapsed or refractory systemic ALCL, with a median duration of response lasting 12.6 months [18]. Long-term follow-up confirmed durable remissions in a subset of patients, with some maintaining continuous CR for over 5 years [19]. In frontline therapy, the ECHELON-2 trial found that combining brentuximab vedotin with CHP (cyclophosphamide, doxorubicin, and prednisone) significantly improved progression-free survival (PFS) and OS compared to CHOP. The 5-year PFS was 51% for the combination compared to 43% for CHOP, and the 5-year OS was 70% versus 61% [20]. These findings support the integration of brentuximab vedotin into standard management, particularly for ALK-negative cases, where the prognosis tends to be poorer.

In cases of relapsed ALK-positive ALCL, ALK inhibitors like crizotinib have demonstrated promising effectiveness, with 12-month survival rates approaching 70% [19]. However, despite these advancements, the overall prognosis for ALK-negative patients remains poor, characterized by lower survival rates and a higher risk of relapse, particularly in cases with high tumor burden and resistance to initial treatments [9].

3.5 Case Particularities

This case presents atypical age presentation, as it involves a 27-year-old patient diagnosed with ALK-negative ALCL, such cases are rarely reported in younger individuals. The prognostic implications of younger patients in ALK-negative ALCL are not well established. Some studies suggest that younger patients may have better performance status and greater tolerance for intensive therapies, which could lead to improved outcomes compared to older patients [5,10,11]. Although the younger age does not seem to mitigate the overall poor prognosis associated with ALK negativity, as molecular factors like DUSP22 or TP63 rearrangements are stronger determinants of survival.

The absence of favorable molecular features underscores the aggressive biology of this case, while also highlighting the need for novel targeted approaches beyond conventional chemotherapy. Another point about our case we feature that the use of BV-based therapy allowed a complete and durable metabolic remission in a young patient with ALK-negative ALCL, consistent with outcomes reported in the literature. Besides, this case highlights the need to recognize that ALK-negative ALCL, typically linked to older age, can also affect younger adults, presenting significant diagnostic and therapeutic challenges.

4. Conclusion

This case underscores the importance of careful differential diagnosis in ALCL ALK-negative, a rare and aggressive lymphoma subtype. The combination of histopathological, immunohistochemical, and molecular findings is crucial for accurate diagnosis, and advances in targeted therapies provide new opportunities to improve treatment outcomes for patients with this subtype. Ongoing research into molecular markers and novel treatments will be vital to improving long-term outcomes for patients with ALCL ALK-negative.

Funding: This work was supported by the Sao Paulo Research Foundation (FAPESP; 2018/20403-6; 2023/02755-0) and the National Council for Scientific and Technological Development (CNPq; 303735/2021-0; 382803/2025-6).

Research Ethics Committee Approval: We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

Acknowledgments: None.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Fornari A, Piva R, Chiarle R, Novero D, Inghirami G. Anaplastic large cell lymphoma: one or more entities among T-cell lymphoma? *Hematol Oncol.* 2009;27(4):161-70. doi: 10.1002/hon.897.
2. Stein H, Foss HD, Dürkop H, et al. CD30(+) anaplastic large cell lymphoma: a review of its histopathologic, genetic, and clinical features. *Blood.* 2000 Dec 1;96(12):3681-95. PMID: 11090048.
3. Swerdlow SH, Campo E, Harris NL, et al. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues. WHO Classification of Tumours, revised 4th edition, Volume 2 [online]. 2017.
4. Zhao S, Li J, Xia Q, Liu K, Dong Z. New perspectives for targeting therapy in ALK-positive human cancers. *Oncogene.* 2023;42(24):1959-1969. doi: 10.1038/s41388-023-02712-8.
5. Parkhi M, Bal A, Das A, et al. ALK-Negative Anaplastic Large Cell Lymphoma (ALCL): Prognostic Implications of Molecular Subtyping and JAK-STAT Pathway. *Appl Immunohistochem Mol Morphol.* 2021;29(9):648-656. doi: 10.1097/PAI.0000000000000936.
6. Mereu E, Pellegrino E, Scarfò I, Inghirami G, Piva R. The heterogeneous landscape of ALK negative ALCL. *Oncotarget.* 2017;8(11):18525-18536. doi: 10.18632/oncotarget.14503.
7. Leventaki V, Bhattacharyya S, Lim MS. Pathology and genetics of anaplastic large cell lymphoma. *Semin Diagn Pathol.* 2020;37(1):57-71. doi: 10.1053/j.semmp.2019.12.002.
8. Harris NL, Jaffe ES, Stein H, et al. A revised European-American classification of lymphoid neoplasms: a proposal from the International Lymphoma Study Group. *Blood.* 1994;84(5):1361-92. PMID: 8068936.
9. Shustov A, Soma L. Anaplastic Large Cell Lymphoma: Contemporary Concepts and Optimal Management. *Cancer Treat Res.* 2019;176:127-144. doi: 10.1007/978-3-319-99716-2_6.
10. Savage KJ, Harris NL, Vose JM, Ullrich F, Jaffe ES, Connors JM, Rimsza L, Pileri SA, Chhanabhai M, Gascoyne RD, Armitage JO, Weisenburger DD; International Peripheral T-Cell Lymphoma Project. ALK- anaplastic large-cell lymphoma is clinically and immunophenotypically different from both ALK+ ALCL and peripheral T-cell lymphoma, not otherwise specified: report from the International Peripheral T-Cell Lymphoma Project. *Blood.* 2008 Jun 15;111(12):5496-504. doi: 10.1182/blood-2008-01-134270.
11. Hapgood G, Savage KJ. The biology and management of systemic anaplastic large cell lymphoma. *Blood.* 2015 Jul 2;126(1):17-25. doi: 10.1182/blood-2014-10-567461. Epub 2015 Apr 13. PMID: 25869285.
12. Pedersen MB, Hamilton-Dutoit SJ, Bendix K, Ketterling RP, Bedroske PP, Luoma IM, Sattler CA, Boddicker RL, Bennani NN, Nørgaard P, Møller MB, Steiniche T, d'Amore F, Feldman AL. DUSP22 and TP63 rearrangements predict outcome of ALK-negative anaplastic large cell lymphoma: a Danish cohort study. *Blood.* 2017 Jul 27;130(4):554-557. doi: 10.1182/blood-2016-12-755496.
13. Vose J, Armitage J, Weisenburger D; International T-Cell Lymphoma Project. International peripheral T-cell and natural killer/T-cell lymphoma study: pathology findings and clinical outcomes. *J Clin Oncol.* 2008;26(25):4124-30. doi: 10.1200/JCO.2008.16.4558.
14. Kao EY, Mukkamalla SKR, Lynch DT. ALK Negative Anaplastic Large Cell Lymphoma. 2023 Aug 28. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. PMID: 30085561.
15. Amador C, Feldman AL. How I Diagnose Anaplastic Large Cell Lymphoma. *Am J Clin Pathol.* 2021 Mar 15;155(4):479-497. doi: 10.1093/ajcp/qaab012.

16. Ferreri AJ, Govi S, Pileri SA, Savage KJ. Anaplastic large cell lymphoma, ALK-negative. *Crit Rev Oncol Hematol*. 2013 Feb;85(2):206-15. doi: 10.1016/j.critrevonc.2012.06.004. Epub 2012 Jul 11. PMID: 22789917.
17. Shustov A, Cabrera ME, Civallero M, Bellei M, Ko YH, Manni M, Skrypets T, Horwitz SM, De Souza CA, Radford JA, Bobillo S, Prates MV, Ferreri AJM, Chiattonne C, Spina M, Vose JM, Chiappella A, Laszlo D, Marino D, Stelitano C, Federico M. ALK-negative anaplastic large cell lymphoma: features and outcomes of 235 patients from the International T-Cell Project. *Blood Adv*. 2021;5(3):640-648. doi: 10.1182/bloodadvances.2020001581.
18. Pro B, Advani R, Brice P, Bartlett NL, Rosenblatt JD, Illidge T, Matous J, Ramchandren R, Fanale M, Connors JM, Yang Y, Sievers EL, Kennedy DA, Shustov A. Brentuximab vedotin (SGN-35) in patients with relapsed or refractory systemic anaplastic large-cell lymphoma: results of a phase II study. *J Clin Oncol*. 2012 Jun 20;30(18):2190-6. doi: 10.1200/JCO.2011.38.0402.
19. Özbalak M, Salihoğlu A, Soysal T, Karadoğan İ, Paydaş S, Özdemir E, Yıldız B, Karadurmuş N, Kaynar L, Yagci M, Özkocaman V, Topçuoğlu P, Özcan M, Birtaş E, Göker H, Ferhanoglu B. Long-term results of brentuximab vedotin in relapsed and refractory Hodgkin lymphoma: multi-center real-life experience. *Ann Hematol*. 2020 Feb;99(2):301-307. doi: 10.1007/s00277-019-03899-1.
20. Horwitz S, O'Connor OA, Pro B, Trümper L, Iyer S, Advani R, Bartlett NL, Christensen JH, Morschhauser F, Domingo-Domenech E, Rossi G, Kim WS, Feldman T, Menne T, Belada D, Illés Á, Tobinai K, Tsukasaki K, Yeh SP, Shustov A, Hüttmann A, Savage KJ, Yuen S, Zinzani PL, Miao H, Bunn V, Fenton K, Fanale M, Puhlmann M, Illidge T. The ECHELON-2 Trial: 5-year results of a randomized, phase III study of brentuximab vedotin with chemotherapy for CD30-positive peripheral T-cell lymphoma. *Ann Oncol*. 2022 Mar;33(3):288-298. doi: 10.1016/j.annonc.2021.12.002.