Head and Neck Pathology (2019) 13:711–717
https://doi.org/10.1007/s12105-018-0948-9

CASE REPORT

T-Cell/Histiocyte-Rich Large B-Cell Lymphoma: Report of the First Case in the Mandible

Ricardo Natã Fonseca Silva[1] · Elismauro Francisco Mendonça[1,2] · Aline Carvalho Batista[1] · Rita de Cássia Gonçalves Alencar[3] · Ricardo Alves Mesquita[4] · Nadia Lago Costa[1]

Received: 4 May 2018 / Accepted: 12 July 2018 / Published online: 17 July 2018

Abstract
T-cell/histiocyte-rich large B-cell lymphoma (THRBCL) is an uncommon subtype of non-Hodgkin's lymphoma. It is a predominant nodal neoplasm; however, extranodal sites, such as the spleen, liver and bone marrow, can be involved at diagnosis. However, only one case of primary THRLBCL in the jaws have been reported. We herein describe a 29-year-old female patient who presented with a swelling of the right mandible that had grown rapidly over the previous 2 months. Periapical and panoramic radiographs showed a multilocular osteolytic lesion located in the mandibular periapical region of the canine and premolar teeth and molar region. Preoperative examination and incisional biopsy were performed. Immunohistochemistry was applied to confirm the diagnosis of THRBCL in the jaw. The treatment consisted of CHOP therapy and radiotherapy. After complete tumor remission following initial treatment, additional sites of the disease appeared in the lung, abdomen and long bones. The patient died within 2 months. THRLBCL is an uncommon and aggressive malignant neoplasm that can involve the jaws, mimicking a periapical disease.

Keywords Jaw · Lymphoma · Non-hodgkin · Lymphoma · Large B-cell · Diffuse · Periapical diseases

Introduction

Two main types of lymphoma have been described in the literature, Hodgkin's lymphoma (HL) and non-Hodgkin's lymphoma (NHL). HL rarely shows extranodal disease, whereas NHL presents as extranodal involvement in 40% of the cases. Oral and maxillofacial region involvement is seen in only 2–3% of cases [1–3]. The most common histological subtype of NHL in the oral and maxillofacial region is diffuse large B-cell lymphoma (DLBCL) [1, 3]. T-cell/histiocyte-rich large B-cell lymphoma (THRBCL) is an uncommon subtype of DLBCL, accounting for approximately 1–3% of all cases of DLBCL [4–7]. The World Health Organization (WHO) define THRBCL as "a limited number of scattered, large, atypical B cells embedded in a background of abundant T cells and histiocytes" [8].

THRBCL mainly affects the lymph nodes; however, the involvement of extranodal sites, such as the spleen, liver and bone marrow, is often observed [4, 8, 9]. In the English-language literature, including this case, only two cases of primary THRLBCL in the jaws have been reported [10]. The prognosis of THRLBCL is very poor, and almost 50% of all patients die within 3–5 years [1, 4, 9]. In this paper, we describe the first case of THRLBCL originating in the mandible.

Case Report

A 29-year-old black woman was referred to the Oral Disease Center of the School of Dentistry at the Federal University of Goias (Brazil) for evaluation of swelling of the right mandible that had grown rapidly over the past 2 months. She

✉ Nadia Lago Costa
nadialago@hotmail.com

1 Department of Stomathology (Oral Pathology), School of Dentistry, Federal University of Goias, Goiânia, GO, Brazil

2 Division of Head and Neck, Araújo Jorge Hospital, Association of Cancer Combat of Goiás, Goiânia, Brazil

3 Laboratory of Pathology, Araújo Jorge Hospital, Association of Cancer Combat of Goiás, Goiânia, Brazil

4 Department of Oral Surgery and Pathology, School of Dentistry, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil

reported experiencing dental pain, numbness, tooth mobility, fever and tiredness. Extraoral physical examination revealed a slight increase in volume of the right mandibular region. An intraoral examination showed an expansion which was covered by mucosa of normal color and texture, located in the buccal and lingual cortical plates of the right mandible in the region of the canine and premolar teeth (Fig. 1a). It had a fibrous consistency on palpation. The teeth associated with the lesion showed mobility. The patient's medical history and socio-economic status were otherwise noncontributory.

Panoramic radiograph showed an area localized between the first premolar and first molar on the right side of the mandible, which was totally radiolucent, poorly defined and had an irregular shape (Fig. 2a). Irregular widening of the periodontal ligament space and destruction of the lamina dura of the first and second premolars and canine and lateral incisors were verified in the periapical and occlusal radiographs (Fig. 2b, c). Pulp vitality testing using a tetrafluoroethane spray (EndoIce Hygenic Corp, Akron, OH) confirmed a positive response in all teeth associated with the radiolucent area. Based on the clinical and radiographic findings, clinical diagnosis of the malignant lesion was made, with differential diagnosis including NHL, Langerhans's cell disease, osteosarcoma and metastasis.

An incisional biopsy was performed under local anesthesia. The specimen, which had been fixed in a 10% buffered formalin solution, was submitted to histological examination. Microscopic findings showed a solid lymphoproliferative lesion with a diffuse growth pattern in sheets, as well as infiltration of the muscle cells. The stroma was poor and was

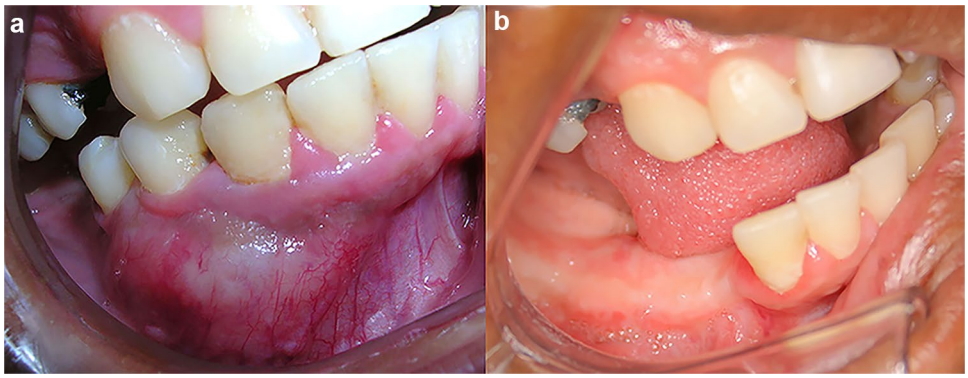

Fig. 1 **a** Clinical features of the lesion showing firm swelling in right mandible in the region of the canine and premolar teeth, covered by mucosa of normal color and texture. **b** Clinical view after 6 months showing total remission of lesions

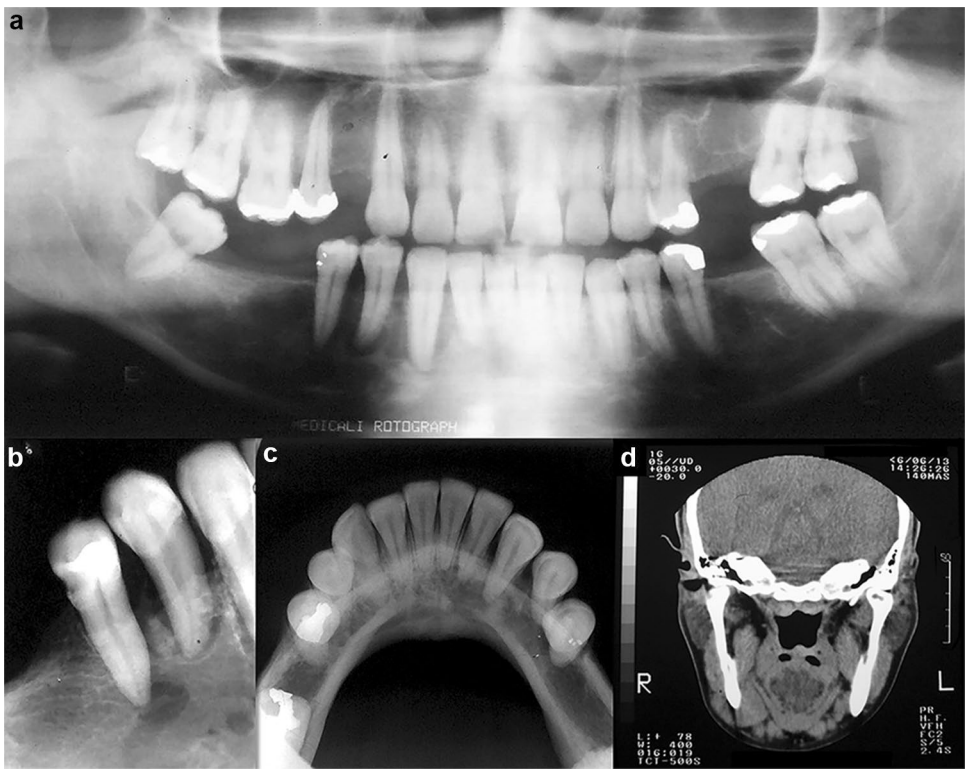

Fig. 2 **a** Panoramic radiograph showing an area localized between the first premolar and first molar on the right side of the mandible, which was totally radiolucent, poorly defined and had an irregular shape. Irregular widening of the periodontal ligament space and destruction of the lamina dura of the premolar first, premolar second, canine and lateral incisor were verified in the periapical (**b**) and occlusal (**c**) radiographs. **d** Conventional tomography showing an isodense lesion located in the posterior region of the right mandible (frontal slice)

composed of few and small blood vessels. The lymphoproliferative infiltration consisted predominantly of small lymphoid cells and few scattered large atypical cells with round, oval or sometimes abnormal nuclei with prominent nucleoli (Fig. 3a, b). An immunohistochemical reactions panel was performed (Table 1). The large atypical cells were immunopositive for CD20 and Bcl-2, and negative for CD30 (Fig. 3c, d). The background was composed of a varying number of $CD68^+$ histiocytes, as well as $CD5^+$, $CD45RO^+$ T-cells (Fig. 3e, f; Table 1). As a result, the diagnosis of THRLBCL was made.

The patient was referred to the Hematology/Oncology Service of the Araújo Jorge Cancer Hospital in Goiânia, Brazil. A comprehensive investigation was performed, including computerized tomography imaging of the head, neck, chest, abdomen and pelvis, in addition to hematological examination. The results indicated solely mandibular lesion (Fig. 2d). Additionally, bone marrow aspirate did not contain neoplastic cells. The treatment consisted of six cycles of chemotherapy with cyclophosphamide (750 mg/m^2), doxorubicin (50 mg/m^2), oncovin (1.4 mg/m^2) and prednisone (100 mg) (CHOP) and ten sections of radiotherapy (40 Gy). After the course of treatment, 6 months after diagnosis, total remission of the jaw lesion was observed (Fig. 1b). However, after 12 months of treatment, the disease appeared in the lung, abdomen, pelvis and femur. The patient received a salvage treatment for relapsed THRLBCL with ifosfamide (5 g/m^2), carboplatin

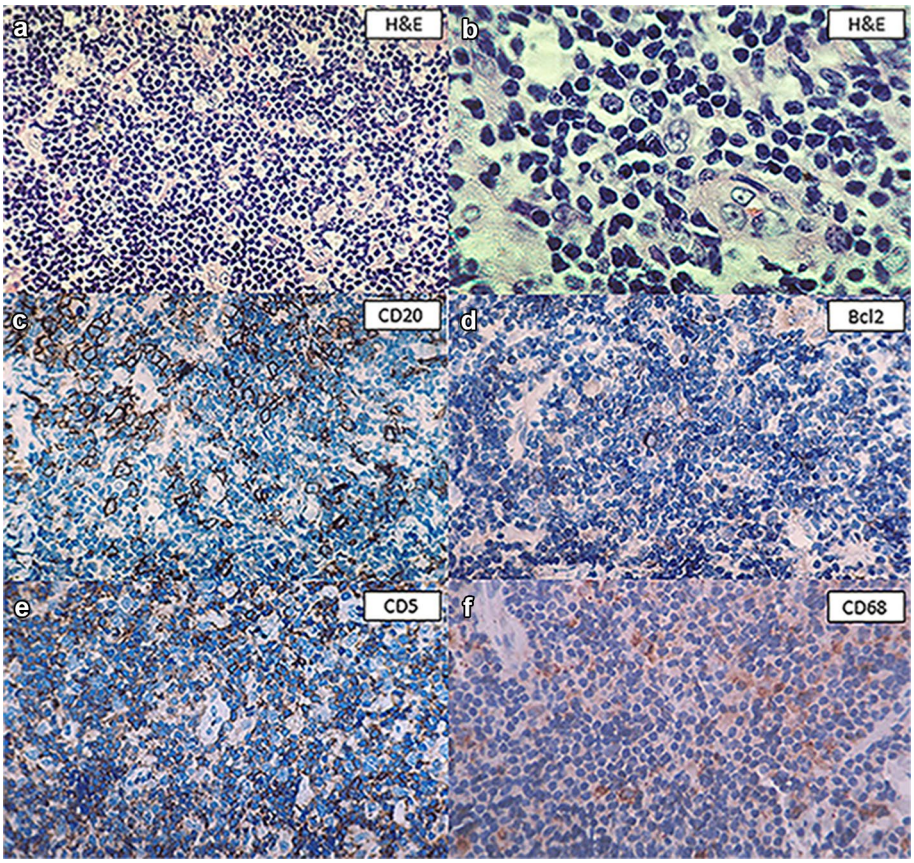

Fig. 3 Primary oral cavity T-cell/histiocyte-rich large B-cell lymphoma. **a** and **b** Hematoxylin-eosin staining showing a diffuse lesion with neoplastic infiltration consisting of large atypical cells in a background rich in small lymphoid cells (original magnification for "**a**" is ×400 and "**b**" is ×1000). **c**–**f** Immunohistochemical staining showing disperse large atypical cells positive for CD20 (**c**) and Bcl2 (**d**), with the background containing numerous CD5-positive lymphocytes (**e**) and some CD68-positive histiocytes (**f**) (original magnification ×400)

Table 1 Antibodies utilized for immunohistochemistry panel evaluation

Antibodies	Clone	Dilution	Manufacturer
Monoclonal mouse anti-human CD-20	L26	1:500	Thermo Scientific, Waltham, MA, USA
Monoclonal mouse anti-human CD-45RO	UCHL-1	1:600	Thermo Scientific, Waltham, MA, USA
Monoclonal mouse anti-human CD-68	KP1	1:1000	Novocastra, Newcastle, UK
Monoclonal mouse anti-human CD-30	Ber-H2	1:100	Dako, Carpinteria, CA, USA
Monoclonal mouse anti-human CD-5	53–7.3	1:800	Santa Cruz Biotechnology, Santa Cruz, CA
Monoclonal mouse anti-human Bcl-2	124	1:500	Dako, Carpinteria, CA, USA

(525 mg) and etopososide (100 mg/m^2), but she died after the second cycle of chemotherapy.

Discussion

T-cell/histiocyte-rich large B-cell lymphoma is a predominant nodal neoplasm, but extranodal sites can be involved [4, 8]. An analysis of the 61 published cases of THRLBCL revealed the liver (52%), spleen (31%), bone marrow (27%) and lung (13%) as the most common sites of extranodal manifestation of disease [9]. In their study, Abramson et al. [4] reported spleen and liver involvement in 43–60 and 33–40% of patients, respectively, and involvement of the bone marrow in 33% of patients. However, to date, only one case of primary THRLBCL was reported to involve the oral and maxillofacial region [10].

Primary NHL arising in the oral and maxillofacial region is rare, making up about 0.6% of all extranodal NHL [11]. Triantafillidou et al. [12] evaluated 58 patients with primary extranodal NHL of the oral and maxillofacial region, and only 5.2% of cases (n = 3) were in the mandible or maxilla. Pereira et al. [13] published an analysis of 29 cases of NHL appearing in the periapical region, with the mandible being one of the more commonly affected sites (58.6% of cases), and the most common type of NHL was DLBCL (51.7%). Similar results were found by Djavanmard et al. [14] who reported that 68.7 and 31.3% of extranodal NHL affected the maxilla and mandible, respectively.

NHL appearing in the periapical region can be misdiagnosed as endodontic lesions because of their non-specific signs and symptoms, delaying diagnosis and appropriate management [13, 15, 16]. Pereira et al. [13] also reported endodontic treatment and tooth extraction in 52.7 and 24.1% of cases, respectively, prior to the diagnosis of lymphoma, indicating that most cases are initially misdiagnosed. Despite this, the clinical and radiograph features of the lesion in the periapical region in our case was highly suggestive of malignancy, and this was important to avoid misdiagnosis.

Patients with NHL in the oral and maxillofacial region commonly complain of pain and swelling, and less frequently, tooth mobility, numbness and paresthesia. Despite their malignant nature, these lesions also can be painless [3, 13, 14]. The radiographic signs of bone involvement may not be specific; however, the radiographic findings are usually poorly defined radiolucency with irregular margins which might resemble a periapical inflammatory process [2, 3, 13, 17, 18]. The presence of paresthesia and/or radiographic evidence of destruction of the underlying bone, root resorption and tooth mobility can assist in differentiating between odontogenic lesions and NHL [2, 3, 13, 17, 18]. Thus, it is important that biopsy intervention and referral of the lesion for histological analysis be considered when vital teeth and clinical or radiographic signs differ from the classical features of inflammatory conditions. Our current case presented clinical conditions similar to those described previously. The patient presented with swelling, dental pain, numbness, tooth mobility and a diffuse bone radiolucent area. Additionally, the pulp vitality test confirmed a positive response in all teeth associated with the lesions. Thus, a periapical inflammatory process was excluded and an incisional biopsy considered on the suspicion of a malignant lesion.

Similar to the morphologic findings of the present case, the presence of clonal B-cells in THRLBCL comprises less of 10% of the total lymphoid cells, and stromal reactive T-cells dominant in the neoplasm are considered a host immune response against neoplastic clones. The large atypical lymphoid cells sometimes present a clear cytoplasm and multilobated nuclei [4, 8, 19]. The most important problem concerning histomorphological aspects of THRLBCL is that these lymphomas are frequently misdiagnosed as either peripheral T-cell lymphoma or HL accompanied by Reed-Sternberg-like cells. However, unlike HL, all of the B-cells in THRLBCL have neoplastic features and are negative for CD30, CD15 or CD138 [4, 8, 20].

Immunohistochemical analysis shows that neoplastic B-cells in THRLBCL express CD20, which is in contrast to Reed-Sternberg cells of HL which are usually positive for CD30 or CD15. A variable number of neoplastic B-cells express Bcl-2, a known negative prognostic marker for DLBCL. The non-neoplastic background environment is composed of lymphocytes with a CD3, CD5 or CD45RO profile, and also typically contain CD68 histiocytes [4, 8, 20]. In the present case, malignant B-cells were positive for CD20 and Bcl-2 and negative for CD30, and the reactive background infiltrate was positive for CD5, CD45RO and CD68. This corroborates the immunohistochemical findings reported in the literature for THRLBCL in other locations [8, 21–27]. The immunohistochemistry findings in the present case were fundamental to the direction of the final diagnosis of this rare variant of DLBCL localized in the jaw, owing to the similarity of the clinical and radiographic characteristics of this case with those of other typical cases of DLBCL described in the literature [13, 16].

T-cell/histiocyte-rich large B-cell lymphoma is an aggressive form of NHL. The disease is often disseminated at the time of diagnosis because the majority of patients present with disease at Ann Arbor stage III–IV (64%) [7, 8]. CHOP therapy is recommended as the standard treatment for THRLBCL. Recent series have shown that the complete response rate of THRLBCL to this chemotherapy regimen ranges from 48 to 85%, and the 3-year overall survival rate is between 46 and 58% [7, 9]. Cases that spread to adjacent organs or thoracic structures, as seen in the current patient, are associated with an unfavorable clinical outcome [28]. As seen in our patient, cases involving histiocytes are reported

Table 2 Summary of the clinical and histologic data collected from the literature on DLBCL and THRBCL located in the periapical region of the jaw

References		Age (years)	Gender	Location	Histologic type	Treatment	Metastasis	Recurrence	Outcome
1	Present case	29	F	Mandible	THRBCL	CHOP	Yes	Yes	Dead
2	Furze et al. [10]	NR	NR	Hard palate	THRBCL	NR	NR	NR	NR
3	Eisenbud et al. [29]	49	F	Mandible	DLBCL	Radiotherapy	No	No	Alive
4	Eisenbud et al. [29]	44	M	Mandible	DLBCL	Radiotherapy	No	No	Alive
5	Eisenbud et al. [29]	44	F	Maxilla	DLBCL	CHOP	NR	–	Dead
6	Gusenbauer et al. [30]	53	M	Mandible	DLBCL	CHOP + Radiotherapy	No	No	Alive
7	Wright and Randman [31]	37	M	Mandible	DLBCL	Radiotherapy + Chemotherapy	No	No	Alive
8	Parrington and Punnia-Moorthy [32]	57	M	Mandible	DLBCL	Radiotherapy	No	NR	NR
9	Pazoki et al. [15]	58	F	Mandible	DLBCL	CHOP	No	No	Alive
10	Pazoki et al. [15]	58	M	Maxilla	DLBCL	CHOP + Radiotherapy	No	No	Alive
11	Pazoki et al. [15]	45	F	Mandible	DLBCL	CHOP + Radiotherapy	No	No	Alive
12	Pazoki et al. [15]	33	F	Mandible	DLBCL	Chemotherapy	No	NR	NR
13	Longo et al [11]	45	M	Mandible	DLBCL	CEOP + Radiotherapy	No	No	Alive
14	Kini et al. [33]	55	M	Mandible	DLBCL	CHOP	No	No	Alive
15	Agrawal et al. [34]	30	F	Maxilla	DLBCL	CHOP	NR	–	Dead
16	Fischer et al. [35]	34	M	Maxilla	DLBCL	NR	NR	NR	NR
17	Hopp et al. [36]	39	M	Mandible	DLBCL	R-CHOP + Radiotherapy	No	No	Alive
18	Jessri et al. [37]	32	M	Mandible	DLBCL	R-CHOP	No	No	Alive
19	Mendonça et al. [16]	38	F	Mandible	DLBCL	CHOP	No	No	Alive
20	Wong et al. [38]	50	M	Maxilla	DLBCL	R-CHOP	No	No	Alive
21	Wong et al. [38]	31	F	Maxilla	DLBCL	R-CHOP	No	No	Alive
22	Carbone et al. [18]	71	F	Mandible	DLBCL	NR	Yes	NR	NR
23	Bugshan et al. [39]	54	M	Mandible	DLBCL	NR	NR	NR	NR
24	Pereira et al. [13]	48	M	Mandible	DLBCL	CHOP	No	No	Alive
25	Zou et al. [40]	67	F	Maxilla	DLBCL	CHOP + R-CHOP	No	No	Alive

F female, *M* male, *THRBCL* T-cell/histiocyte-rich large B-cell lymphoma, *DLBCL* diffuse large B-cell lymphoma, *CHOP* cyclophosphamide, doxorubicin, oncovin and prednisone, *R-CHOP* rituximab, cyclophosphamide, doxorubicin, oncovin and prednisone, *CEOP* vincristine, cyclophosphamide, epirubicin, prednisone, *NR* not reported

to represent patients with very aggressive THRLBCL and frequent failure of current therapies [8]. Here, the choice of treatment was CHOP therapy combined with radiotherapy, which was associated with an unfavorable outcome in this patient.

The literature review, including this case, showed 25 complete detailed cases of DLBCL (n = 23) and THRBCL (n = 2) appearing in the periapical region of the jaw (Table 2). The mandible was the more commonly affected site with 16 cases out of 25 cases (58.6%). In contrast to the present case, in the clinical cases of DLBCL described, only 1 reported metastases, and 2 reported died.

Conclusion

In summary, THRLBCL is an uncommon and aggressive NLH that rarely involves the oral and maxillofacial region. The clinical and radiographic characteristics of THRLBCL in the oral cavity can be similar to those of a typical case of DLBCL. Thus, accurate diagnosis requires careful examination of tumor cells and the background cellular infiltrate, which is critical to reaching the correct diagnosis in cases with suspicion of lymphoma in the jaw.

Funding The first author declares no funding grants were received or otherwise associated with the production of this paper.

Compliance with Ethical Standards

Conflict of interest All authors named in this case report declare that they have no conflict of interest.

Research Involving Human and Animal Participants This article does not contain any studies with human participants or animals performed by any of the authors.

References

1. Epstein JB, Epstein JD, Le ND, Gorsky M. Characteristics of oral and paraoral malignant lymphoma: a population-based review of 361 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001;92:519–25.
2. Kemp S, Gallagher G, Kabani S, Noonan V, O'Hara C. Oral non-Hodgkin's lymphoma: review of the literature and World Health Organization classification with reference to 40 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008;105:194–201.
3. Ferry JA, Li XO. Haematolymphoid tumours. In: El-Naggar AK, Chan J, Takata T, Grandis J, Blootweg P, editors. World health classification of head and neck tumours. 4th ed. Lyon: IARC Press; 2017. pp. 128–9.
4. Abramson JS. T-cell/histiocyte-rich B-cell lymphoma: biology, diagnosis, and management. Oncologist 2006;11:384–92.
5. Pittaluga S, Jaffe ES. T-cell/histiocyte-rich large B-cell lymphoma. Haematology 2010;95:352–6.
6. Fraga M, Sánchez-Verde L, Forteza J, García-Rivero A, Piris MA. T-cell/histiocyte-rich large B-cell lymphoma is a disseminated aggressive neoplasm: differential diagnosis from Hodgkin's lymphoma. Histopathology 2002;41:216–29.
7. Bouabdallah R, Mounier N, Guettier C, Molina T, Ribrag V, Thieblemont C, et al. T-cell/histiocyte-rich large B-cell lymphomas and classical diffuse large B-cell lymphomas have similar outcome after chemotherapy: a matched-control analysis. J Clin Oncol. 2003;21:1271–7.
8. Swerdlow SH, Campo E, Harris NL, Jaffe ES, Pileri SA, Stein H et al, editors. WHO classification of tumours of haematopoietic and lymphoid tissues. 4th ed. Lyon: IARC Press; 2017.
9. El Weshi A, Akhtar S, Mourad WA, Ajarim D, Abdelsalm M, Khafaga Y, et al. T-cell/histiocyte-rich B-cell lymphoma: clinical presentation, management and prognostic factors: report on 61 patients and review of literature. Leuk Lymphoma. 2007;48:1764–73.
10. Furze AD, Defatta R, Ducic Y. Pathology case quiz 2. Diffuse large B-cell lymphoma, T-cell/histiocyte-rich morphological variant, of the hard palate. Arch Otolaryngol Head Neck Surg. 2010;136:207–8.
11. Longo F, De Maria G, Esposito P, Califano L. Primary non-Hodgkin' s lymphoma of the mandible. Report of a case. Int J Oral Maxillofac Surg. 2004;33:801–3.
12. Triantafillidou K, Dimitrakopoulos J, Iordanidis F, Gkagkalis A. Extranodal non-hodgkin lymphomas of the oral cavity and maxillofacial region: a clinical study of 58 cases and review of the literature. J Oral Maxillofac Surg. 2012;70:2776–85.
13. Pereira DL, Fernandes DT, Santos-Silva AR, Vargas PA, Almeida OP, Lopes MA. Intraosseous non-Hodgkin lymphoma mimicking a periapical lesion. J Endod. 2015;41:1738–42.
14. Djavanmardi L, Oprean N, Alantar A, Bousetta K, Princ G. Malignant non-Hodgkin' s lymphoma (NHL) of the jaws: a review of 16 cases. J Craniomaxillofac Surg. 2008;36:410–4.
15. Pazoki A, Jansisyanont P, Ord RA. Primary non-Hodgkin's lymphoma of the jaws: report of 4 cases and review of the literature. J Oral Maxillofac Surg. 2003;61:112–7.
16. Mendonça EF, Sousa TO, Estrela C. Non-Hodgkin lymphoma in the periapical region of a mandible canine. J Endod. 2013;39:839–42.
17. Saund D, Kotecha S, Rout J, Dietrich T. Non-resolving periapical inflammation: a malignant deception. Int Endod J. 2010;43:84–90.
18. Carbone M, Della Ferrera F, Carbone L, Gatti G, Carrozzo M. Numb chin syndrome as first symptom of diffuse large B-cell lymphoma. Case Rep Dent. 2014;41:3162–5.
19. Venizelos ID, Tatsiou ZA, Mandala E. Primary cutaneous T-cell-rich B-cell lymphoma: a case report and literature review. Acta Dermat. 2008;17:177–81.
20. Cornillie J, Tousseyn T, Verhoef G. T-cell/histiocyte-rich large B-cell lymphoma: review on pathologic diagnosis, current therapeutic options and new targets for therapy. Belg J Hematol. 2012;3:128–33.
21. Vezzoli P, Fiorani R, Girgenti V, Fanoni D, Tavecchio S, Balice Y, et al. Cutaneos T-cell/histiocyte-rich B-cell lymphoma: a case report and review of the literature. Dermatology 2011;222:225–30.
22. Ichikawa S, Watanabe Y, Saito K, Kimura J, Ichinohasama R, Harigae H. T-cell/histiocyte-rich large B-cell lymphoma of the thyroid. Exp Hematol Oncol. 2013;2:1–3.
23. Advani P, Starr J, Swaika A, Jiang L, Qiu Y, Li Z, et al. T-cell/histiocyte-rich large B-cell lymphoma presenting as a primary central nervous system lymphoma. Rare Tumors. 2015;7:161–3.
24. Barut F, Kandemir NO, Gun BD, Ozdamar SO. T-cell/histiocyte-rich large B-cell lymphoma of stomach. J Park Med Assoc. 2016;66:905–7.
25. Xu J, Wu X, Reddy V. T-cell/histiocyte-rich large B-cell lymphoma of the thymus: a diagnostic pitfall. Case Rep Hematol. 2016;2016:1–7.
26. Ibrahim U, Garcia G, Saqib A, Hussein S, Dai Q. T cell histiocyte rich large B cell lymphoma presenting as hemophagocytic lymphohistiocytosis: an uncommon presentation of a rare disease. Case Rep Oncol Med. 2017;2017:1–5.
27. Zheng SM, Zou DJ, Chen YH, Jiang R, Wang YX, Zhang Y, et al. Pancreatic T/histiocyte-rich large B-cell lymphoma: a case report and review of literature. World J Gastroenterol. 2017;23:4467–72.
28. Rodriguez J, Pugh WC, Cabanillas F. T-cell-richB-cell lymphoma. Blood 1993;82:1586–9.
29. Eisenbud L, Sciubba J, Mir R, Sachs SA. Oral presentations in non-Hodgkin's lymphoma: a review of thirty-one cases. Part II. Fourteen cases arising in bone. Oral Surg Oral Med Oral Pathol. 1984;57:272–80.
30. Gusenbauer AW, Katsikeris NF, Brown A. Primary lymphoma of the mandible: report of a case. J Oral Maxillofac Surg. 1990;48:409–15.
31. Wright JM, Radman WP. Intrabony lymphoma simulating periradicular inflammatory disease. J Am Dent Assoc. 1995;126:101–5.
32. Parrington SJ, Punnia-Moorthy A. Primary non-Hodgkin's lymphoma of the mandible presenting following tooth extraction. Br Dent J. 1999;187:468–70.
33. Kini R, Saha A, Naik V. Diffuse large B-cell lymphoma of mandible: a case report. Med Oral Patol Oral Cir Bucal. 2009;14:e421–4.
34. Agrawal MG, Agrawal SM, Kambalimath DH. Non-hodgkins lymphoma of maxilla: a rare entity. Natl J Maxillofac Surg. 2011;2:210–3.
35. Fischer DJ, Klasser GD, Kaufmann R. Intraoral swelling and periapical radiolucency. J Am Dent Assoc. 2012;143:985–8.

36. Hopp RN, Marchi MT, Kellermann MG, Rizo VH, Lopes MA, Jorge J. Lymphoma mimicking a dental periapical lesion. Leuk Lymphoma. 2012;53:1008–10.
37. Jessri M, AbdulMajeed AA, Matias MA, Farah CS. A case of primary diffuse large B-cell non-Hodgkin's lymphoma misdiagnosed as chronic periapical periodontitis. Aust Dent J. 2013;58:250–5.
38. Wong GB, Spadafora S, Barbon N, Caputo M. Primary extranodal B-cell non-Hodgkin lymphoma mimicking an endodontic lesion: report of 2 cases. J Can Dent Assoc. 2013;79:d93.
39. Bugshan A, Kassolis J, Basile J. Primary diffuse large B-cell lymphoma of the mandible: case report and review of the literature. Case Rep Oncol. 2015;8:451–5.
40. Zou H, Yang H, Zou Y, Lei L, Song L. Primary diffuse large B-cell lymphoma in the maxilla: a case report. Medicine 2018;97:e10707.