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THE CONTRIBUTION OF THREE-DIMENSIONAL RADIOGRAPHY IN THE DIAGNOSIS OF SOLITARY BONE CYST: SYSTEMATIC REVIEW

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Abstract

Introduction: The aim of this work is to highlight the clinical and three-dimensional radiographic features of this pathology, as well as its crucial role in establishing a positive diagnosis of solitary bone cyst. This, in turn, aims to provide guidance towards appropriate, minimally invasive surgical treatment. **Materials and methods:** Our search was performed using PubMed via Medline, Cochrane, Science Direct, EBSCO and Google Scholar. We selected human studies from the last five years. Five of the eligible studies were retrospective. **Results:** From a total of 5762 articles selected, we were able to retain 5 developed corpora. Extraction of data from these articles revealed that the use of three-dimensional radiography makes it possible to highlight the typical clinical and radiographic features of solitary bone cyst, thus facilitating the establishment of an accurate initial diagnosis. **Discussion:** Solitary bone cysts, affecting the maxillae, present diagnostic challenges due to similarities with other pathologies, and it is essential to have a good knowledge of the clinical and radiographic features to avoid confusion with other similar pathologies. The use of three-dimensional radiography, particularly Cone Beam Computed Tomography (CBCT), is effective for a preliminary diagnosis. While this imaging tool provides valuable insights, a definitive diagnosis may require further confirmation through additional methods, such as Magnetic Resonance Imaging (MRI). **Conclusion:** The integration of artificial intelligence and radiomics offers promising prospects as a research direction rather than an established result, remaining an exploratory approach with the potential to enhance the diagnosis and treatment of solitary bone cysts in the future.
Keywords: three-dimensional radiology, solitary bone cyst, maxillae.

Introduction:

The solitary bone cyst, also known as haemorrhagic, hematic, essential, idiopathic, traumatic, progressive bone cavity or cystic osteodystrophy, is a single lesion generally lacking epithelial borders, which distinguishes it histologically from conventional cysts [1]. It often forms asymptomatically in the mandibular arch, mainly in young people [2]. The history of this lesion dates back to Dupuytren in 1830, although its maxillary location was not documented until 1929 [3]. The WHO recognised this lesion in 1992, classifying it as a benign bone tumour of the odontoid and maxillofacial regions [4]. Diagnosis is often based on incidental radiological findings, although some patients may present with symptoms such as pain, swelling or tooth sensitivity [5]. The preferred treatment is surgical exploration followed by careful curettage of the cavity, which usually results in progressive reossification and a favourable prognosis [6]. However, careful monitoring is necessary because the radiological presentations can be atypical [8] and often confused with other lesions [7], which can lead to confusion with several benign odontogenic tumours [8], misdiagnosis and inappropriate aggressive therapies, hence the interest in proceeding towards a preoperative diagnosis based on three-dimensional radiology, which could help us to further identify the solitary bone cyst.

To provide a more precise answer to this problem, we propose to carry out a systematic review based on IMRAD standards with the following objective: To determine whether clinical and three-dimensional radiographic characteristics can predict a positive diagnosis of solitary bone cyst and guide towards minimally invasive surgical treatment.

Materials & Methods:

Initially, we searched computer databases accessible via the Internet. The main databases included:
PubMed, Science Direct, EBSCO, Google Scholar, Cochrane Library.

To facilitate the search, we first developed a search equation, combining keywords with 'Boolean' operators, thus forming a 'formula' interpreted by the engine to extract the corresponding articles.

We then constructed different blocks of keywords corresponding to the different items PICO, allowing the initial question to be broken down into several elements.

- P: Patient with a solitary bone cyst in the maxillae.
- I: Use of three-dimensional radiography to diagnose a solitary bone cyst.
- C: Comparison with other means of diagnosis, namely three-dimensional radiography.
- O: To evaluate the contribution of three-dimensional radiography in the diagnosis of solitary bone cysts.

After consulting various databases using their respective search engines, the studies must meet inclusion and exclusion criteria. These criteria will be used during subsequent reading of the abstracts and full texts to select appropriate studies.

Inclusion criteria: Articles with a publication date between 2018 and 2023 -Cross-sectional clinical studies-Cohort studies -Case-control clinical studies-Clinical studies in humans.

Exclusion criteria: Articles that did not meet the inclusion criteria-Articles with a publication date prior to 2018-Articles that performed experiments on animals- Randomised and non- randomised clinical trials-Case series and case reports-Articles that did not meet the objectives of our work based on a reading of the abstracts and a critical reading of the full text.

The quality of the studies included in our search was assessed using The Critical Skills Appraisal Programme (CASP) [9]. CASP uses a systematic approach based on 12 criteria, with the option of answering 'Yes', 'No' or 'cannot answer' to each question. Each study could have a maximum score of 12. The results of this evaluation are presented in a grid in (**Table I**). The articles retained have a score ≥ 8.

Table I: Evaluation grid for the methodological quality of CASP studies

Studies (references)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total (score)
1	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	8
2	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
3	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	10
4	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
5	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	9

Results:

Querying the databases using the search strategies identified 5762 articles. The flowchart below summarises the article sorting stages from the initial corpus (5762) to the final corpus [5], (**Figure 1**). To define the selected studies, we classified them by defining the author, title, and year of publication (**Table II**). The numbers assigned to the articles in (**Table III**) were adopted for subsequent presentation of the results.

The qualitative assessment of the risk of bias recommended by the Cochrane Handbook for Systematic Reviews of Interventions 'The Handbook' enabled us to assign a level of bias to each publication (high, uncertain, minimal) with regard to the robustness of its protocol and its relevance in answering the question posed by the systematic review (**Table IV**).

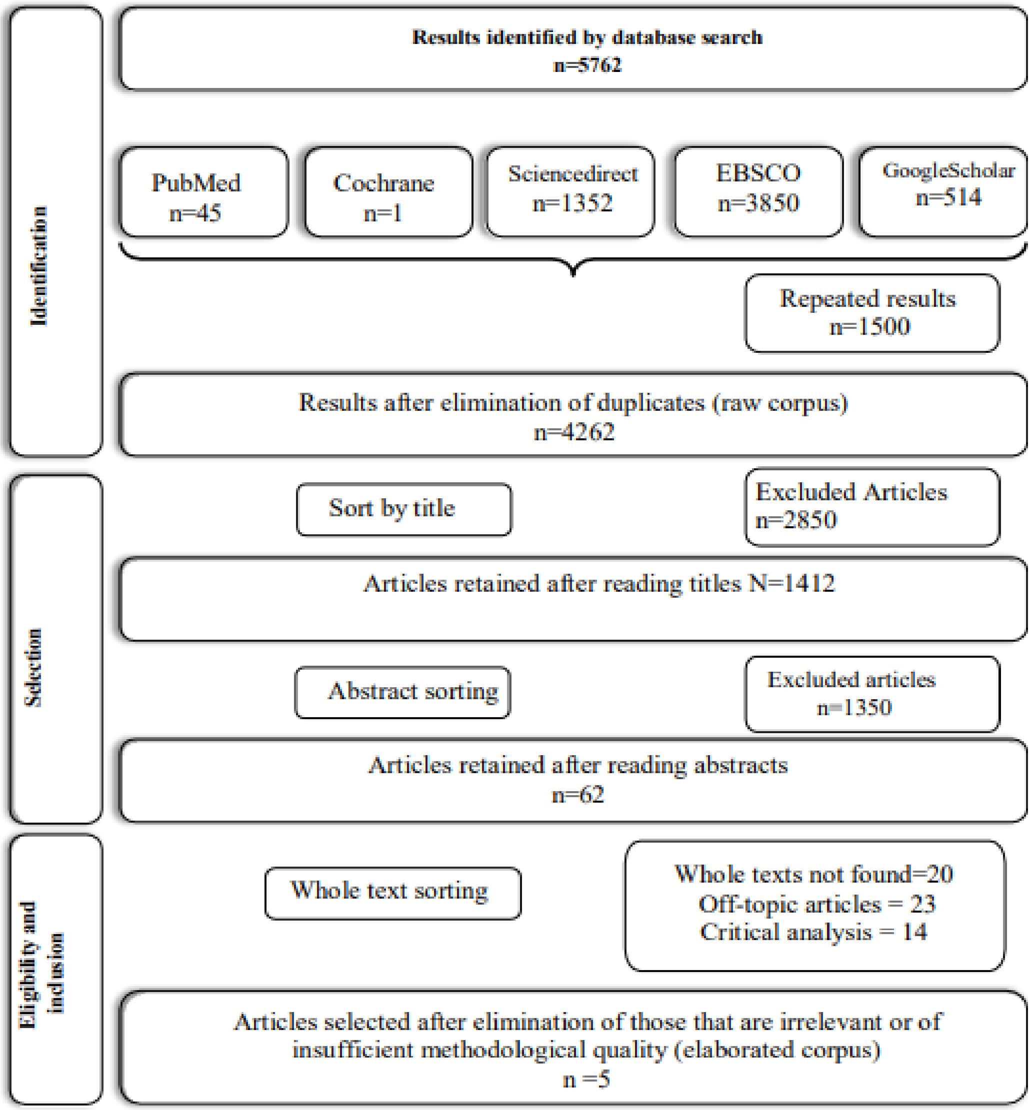

Figure 1: Flowchart summarizing the different stages and the number of articles used at each stage of sorting the raw corpus.

Table II: Summary of the selected articles

Number	Author	Title	Year
1	Ryu J, Nam I, Shin S-H, Kim Y-D, Lee J-Y	Idiopathic bone cavity: clinical and radiological features of 90 retrospective cases and surgical treatment	2021
2	Jiang Z-Y, Lan T-J, Cai W-X, Tao Q	Primary clinical study of radiomics for diagnosing simple bone cyst of the jaw	2021
3	Wang Y, Tang F, Li Z, Chen Q	Pseudocysts of the jaw: a retrospective study of 41 cases from a single institution	2023
4	Choi S-Y, Boboeva O, Ham JY, An C-H, Lee S-T, Kim J-W, An S-Y	Analysis of the fluid contents of simple bone cyst in the mandible	2022
5	Lima L, Filho SA, Paulo L, Servato J, Rosa R, Faria P, Loyola A, Cardoso S	Simple bone cyst: description of 60 cases seen at a Brazilian School of Dentistry and review of international literature	2020

Table III: Summary of studies characteristics

N°	Sample size (sex / age)	Clinical features	Radiographic features	Location	Exploration of the results
1	90 patients (40 men, 50 women), age: 10-58 years	Asymptomatic: 72 patients, Pulpal vitality: 54 patients	**Panoramic:** Contour : Round: 45 Scalloped: 45 **CBCT:** Cortical bone thinning (Mild:51 Moderate: 18 and severe:4); Size: > 3 teeth: Smaller lesion, < 3 teeth: Larger lesion	Maxilla: 1 Mandible:89	Focus on the treatment and surgical management of solitary bone cysts [14] .
2	SBC: 19 patients (11 women, 8 men), mean age :17 years	Asymptomatic Mandibular expansion: 6 patients No tooth displacement	**Panoramic:** Scalloped contour: 15 - Mean height (mm): 28, 08 **CBCT:** Irregular high-density osteoporotic images or prominent bone ridges in the lumen at the margin of the capsule wall Thinning of cortical bone : 17 cases No root resorption and no perforation of cortical bone Ratio NAI/SBC : Far: 6 -Tight: 6 Destruction of bone around NAI: 0 **Radiomic:** **Textured features**: High contrast in SBC, attributed to the presence of blood, air, bone crest, and fragments (measured through GLCM contrast, NGTDM contrast, and GLCM variance). **Non-textured features**: SBC displays a significantly smaller volume; however, size correlations are not explicitly detailed.	Mandible :13	A new method for diagnosing solitary bone cysts uses radiomic features like spatial relationship, texture, shape, intensity, and grey shading, assessed through parameters like GLCM contrast, NGTDM contrast, and GLCM variance, offering high diagnostic accuracy [10].
3	41 patients: SBC (35), Age: Male > 18, Female < 18	-Reasons for consultation: Orthodontic need, swelling -Symptoms in uninjured areas: 17/35 -Pulpal vitality (74 teeth): 61 teeth normal -Malocclusion : 15 patients	**CBCT:** -Unilocular hypodense images with scalloped changes -Presence of osteosclerotic lines -Shape of cavity: Round (74, 29%), Irregular (25, 71%), Unique (91, 43%) **MRI:** Unilocular Fluid level is rare	Maxillary: 4 Mandible: 31	Assessment of the clinical and histological features, emphasizing the role of panoramic, CBCT, and MRI in diagnosis, as well as the surgical and non-surgical treatment options [11].
4	19 patients (9 males, 10 females) , Age: 12-57 years	**Asymptomatic:** 18 patients **1 patient with pain**	**CBCT:** - Evaluated using a 21.2-inch WIDE CX30p 3MP color LED diagnostic monitor - The measured anteroposterior length was 19.3 ± 5.1 mm, the vestibulolingual width was 10.1 ± 3.6 mm, and the height was 15.6 ± 3.7 mm. - All SBCs were unilocular on radiography - Manifested as radiolucency with a radio-opaque region in all three middle-aged patients - No tooth displacement or resorption	Maxilla: no lesions Mandible: 19	Utilized meticulous aspiration techniques under CBCT guidance to assess the contents of the solitary bone cyst cavity precisely [12].
5	60 patients (30 males, 30 females), age: 7-74 years	Symptomatic: 10 patients experienced pain or swelling. Teeth vitality: mostly positive.	**CBCT and panoramic images revealed the following:** - Clear radiographic appearance: 51 cases - Shape: Oval (40 cases) / Cone (9 cases) - Scalloped contours between roots: 21 cases - Displacement of the NAI: 24 cases - Bone expansion: 3 cases - Well-defined contours: 38 cases - No root resorption - Tooth displacement: 2	Maxilla: 1 Mandible: 59	The radiological examination led to a diagnosis and a recommendation for a conservative treatment approach to preserve vital structures[13].

Table IV: Risk of bias in the selected studies

N	Selection bias	Attrition bias	Information bias	Notification bias	Detection bias	Other biases	Risk of bias
1	High	High	Intermediate	Low	Intermediate	Low	Uncertain
2	Low	Low	Low	Low	Low	Low	minim
3	Low	Low	Low	Low	Low	Low	minim
4	Intermediate	Low	Low	Low	Intermediate	Low	minim
5	Intermediate	Minim	Low	Low	Intermediate	Low	Uncertain

The assessment of the observational studies selected showed that: three studies (articles 2, 3 and 4) had a minimal risk of bias, two studies (articles 1 and 5) had a high risk of attrition bias and One study (article 1) had a high risk of selection bias.

Discussion

Solitary bone cysts can occur at any age. Studies by Ryu J. et al. and Choi S. et al. report a significant prevalence in the second decade of life, with mean ages of 21.3 ± 13.2 years and 22.05 ± 14.38 years, respectively. According to Lima L. et al., this condition is frequently diagnosed in young adults, particularly in the second and third decades. It can also affect children and the elderly, especially when associated with cemento-osseous dysplasia.

Ryu J. et al. observed that solitary bone cysts tend to be larger in younger patients, which may explain their reduced frequency in older individuals. Most studies indicate that these cysts primarily occur in the first two decades of life, with a marked decline after the third decade [1,2,15-19].

Gender distribution varies across studies: Lima L. et al. reported a female predominance, while Wang Y. et al., Ryu J. et al., and Choi S. et al. found no significant difference between genders. Some studies suggest a slight male predominance [20,21], whereas others report no significant gender-related variation [22-26]. Occasional studies even indicate a male predominance [27,28].

Solitary bone cysts, often discovered incidentally following traumatic fractures, predominantly develop in the metaphyses of long bones such as the tibia, femur, and humerus, particularly in children and adolescents. They account for approximately 3% of bone tumors [29,30].

Choi S. et al., Lima L. et al., Ryu J. et al., Wang Y. et al., and Jiang Z. et al. found that these lesions occur predominantly in the posterior mandible, less frequently in the anterior teeth, and rarely in the maxilla. A widely accepted theory attributes their formation to aberrant bone growth near the mental foramen, a primary ossification site of the mandible [31]. Lesions predominantly affect the mandibular ramus [32,33] and the anteromedial region of the mandibular body, between the premolars and molars [1,29,34]. Only 2% of cases involve the maxilla, whereas 98% affect the mandible, primarily in its anterior portion [35,36].

Approximately 10% of cases present with multiple cysts, often in patients with multiple bone cyst syndrome [35,36]. These lesions can sometimes affect all areas of the mandible, including bilaterally [17,35,37].

The etiology of solitary bone cysts remains uncertain [38,25]. The most widely accepted hypothesis links their development to non-fracture trauma in young individuals, such as malocclusion or maxillofacial impact, leading to intramedullary hemorrhage and subsequent cavity formation. However, the exact role of trauma in their pathogenesis requires further investigation.

Lima L. et al. proposed an alternative theory, suggesting that an inability of osteoblasts to sustain bone mineral deposition may contribute to cavity formation, particularly in young and middle-aged women [32]. The rarity of blood presence within these cavities further complicates understanding of their pathophysiology.

Wang Y. et al. hypothesized that trauma effects on pseudocysts may be exaggerated, yet even minor trauma can induce intramaxillary hemorrhage and venous involvement." Harnet JC, Lombardi T, Klewansky P, Rieger J, Tempe MH, and Clavert JM" summarized three main theories: aberrant bone growth, tumor degeneration, and trauma-induced hemorrhage [29,39].

The last theory, widely accepted, suggests that trauma leads to intramedullary hemorrhage and hematoma formation, causing venous obstruction and intracapsular exudate. Enzymatic resorption of the exudate results in aseptic necrosis of the bone marrow, which may explain why the mandible is more commonly affected than the maxilla, given the latter's looser cortical bone and richer vascularization [30].

Despite extensive studies on cyst formation, their exact etiopathogenesis remains incompletely understood. Further research is needed to clarify the mechanisms underlying their development.

L. Lima et al. and J. Ryu et al observed that in symptomatic cases, swelling, mild pain, tooth sensitivity, paresthesia, or malocclusion may occur [31]. However, the symptomatology of solitary bone cysts is often subtle, generally asymptomatic, and usually discovered incidentally during radiological examinations. In rare cases, a slight cortical bulge or a sensitive area upon palpation may be noted.

Typical manifestations include the absence of sensory disturbances, abnormal tooth mobility, or dental necrosis [2,37,40,41]. However, localized pain may be present, particularly in cases where a pathological fracture occurs following trauma, sometimes serving as the first clinical manifestation. In most cases, the initial diagnosis is made through radiographic examination conducted for unrelated reasons [42]. Most studies indicate that solitary bone cysts are asymptomatic, rarely associated with cortical expansion, and often discovered incidentally during routine check-ups, with positive dental vitality in the majority of cases [7,37].

Radiographic examination is crucial for assessing the morphology, density, and boundaries of the lesion. Solitary bone cysts typically appear as well-defined, hypodense lesions with scalloped margins between the roots of the teeth (S. Choi et al., L. Lima et al.), as illustrated in (**Figure 2**). Their average diameter is estimated to be 28.08 mm, with a fan-shaped outline and well-defined bony borders. Most cases exhibit homogeneous osteolysis surrounded by a thin sclerotic rim, although some lesions may present a multilocular pattern, mimicking other cystic lesions (Z. Jiang et al.), as seen in (**Figure 3**). Radiographically, solitary bone cysts are characterized by a single, well-demarcated cavity with scalloped borders between the roots, without any signs of root resorption or displacement [7,40,37], as shown in (Figure 4). The presence of an osteosclerotic layer suggests a non-infected lesion, while radiological variations, combined with histopathological analysis, aid in confirming the diagnosis [29]. Although inter-radicular scalloping is a significant diagnostic feature, it is not exclusive, as other odontogenic lesions may also present scalloped margins [43]. "Copete MA, Kawamata A, and Langlais RP" reported this pattern in 68% of cases, observed in both dentate and edentulous areas [20,44-46].

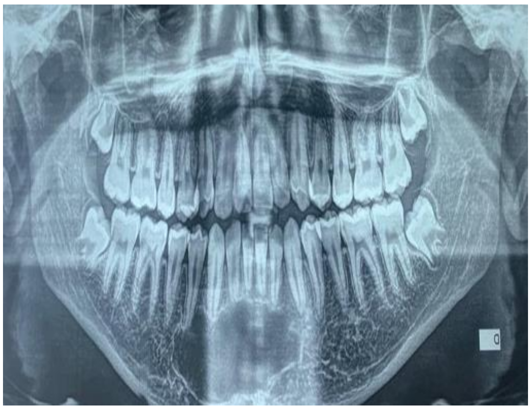

Figure 2: Panoramic radiograph showing a hypodense lesion at the anterior mandible, with the upper border extending from teeth 44 to 33 and characteristic scalloping between teeth 43 and 44.

Figure 3: Panoramic radiograph showing a bilateral multilocular lesion with inter-radicular scalloping along the roots in the posterior mandible [18].

Figure 4: Panoramic radiograph showing scalloping around the root of tooth 47 (arrow), a characteristic feature of solitary bone cysts aiding in differential diagnosis. [10]

On CBCT, solitary bone cysts present with flat lower margins and prominent bony ridges at the cyst wall edges, as observed by Z. Jiang et al. However, CBCT alone does not provide sufficient diagnostic information. Using the PACS viewer, the mean lesion size is estimated at 19.3 x 10.1 x 15.6 mm, without evidence of tooth displacement or root resorption (S. Choi et al.), as illustrated in (**Figure 5**).

Radiographic analysis using CBCT allows for the evaluation of cortical defects and their relationship with the roots, typically revealing unilocular hypodense images with scalloped margins and osteosclerotic lines (Y. Wang et al., S. Choi et al.), as seen in (Figure 6). Cortical expansion is generally absent, and root displacement or resorption is rare (L. Lima et al.), as shown in (**Figure 7**). Lesions do not typically affect the inferior alveolar canal, although minor dislocations have been reported in some cases (Y. Wang et al., L. Lima et al.).

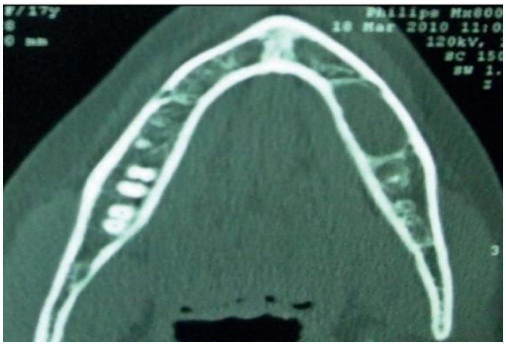

Figure 5: Denta-scan - axial section: hypodense, well-limited image, located within the left horizontal branch with preservation of the medial and lateral cortices [2]

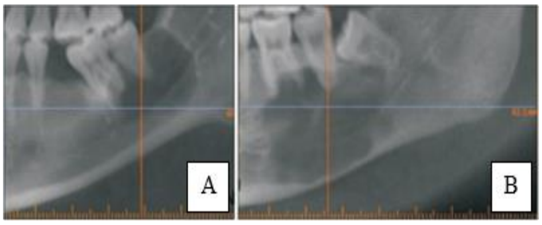

Figure 6: Panoramic view of the contour of solitary bone cyst. A. Rounded contour. B. Scalloped contour [13].

Diagnosis is primarily based on radiographic findings or intraoperative confirmation of an empty bone cavity. CT images frequently show a thinned but intact cortical bone (**Figure 8**), confirming the lesion's benign nature [32]. CBCT measurements often indicate a cavity of approximately 35 x 20 x 10 mm, with cortical thinning but no perforation [34]. Its three-dimensional imaging capability helps clarify lesion margins and differentiate solitary bone cysts from other maxillary cysts and tumors, making it a valuable tool for diagnosis and surgical planning [1,47].

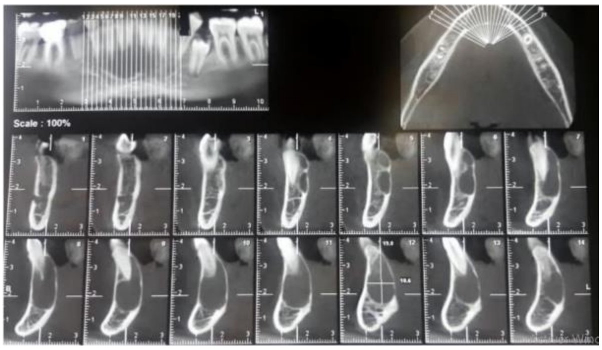

Figure 8: CBCT showing a hypodense zone without perforation of the cortex of the vestibular or lingual side or root invasion [5]

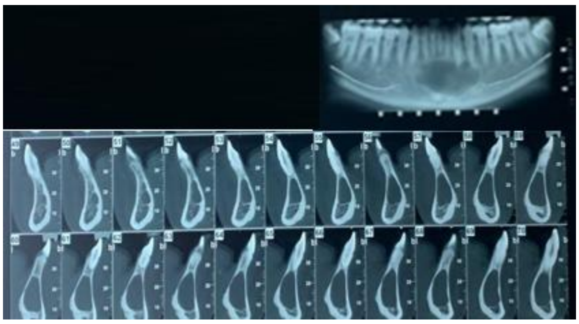

Figure 7: A cone beam shows an isolated, round, unilocular hypodense lesion in the anterio inferior region.

The lesion is characterized by the absence of a bony border, with no resorption or displacement of the adjacent root. There is also thinning of the vestibular and lingual cortex.

Solitary bone cysts appear on magnetic resonance imaging (MRI), as well-demarcated unilocular or multilocular lytic lesions. T1WI with Gd-DTPA contrast enhances the lesion margins and provides slight internal enhancement, aiding in differentiation from true epithelial cysts (Y. Wang et al.), as shown in (Figures 9) and (Figure 10].

MRI, with its superior contrast resolution and multiplanar imaging capabilities, allows for the identification of fluid, fibrous connective tissue, or gas within the lesion, confirming its cystic nature and distinguishing it from benign solid tumors or other jaw cysts [32,48,49]. However, in cases with a purely unilocular appearance, surgical exploration may still be necessary to rule out the presence of a true cyst [49,50].

Additionally, the presence of a thin fibrovascular membrane may mimic epithelial mucosa, necessitating further exploration before considering radical surgical intervention [51]. T1-WI and T2-WI sequences typically reveal homogeneous fluid signal intensities, highlighting the value of dynamic MRI in achieving an accurate diagnosis [49].

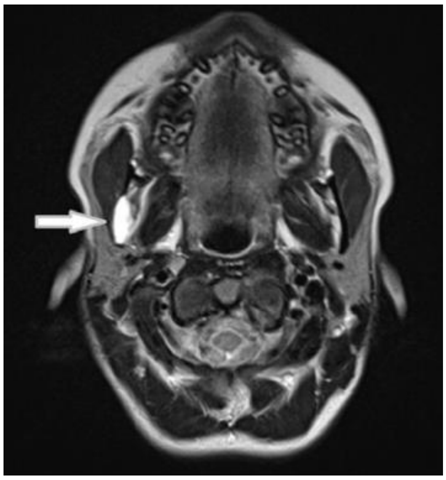

Figure 9: MRI showing a well-defined solitary bone cyst lesion in the right mandibular ramus [45].

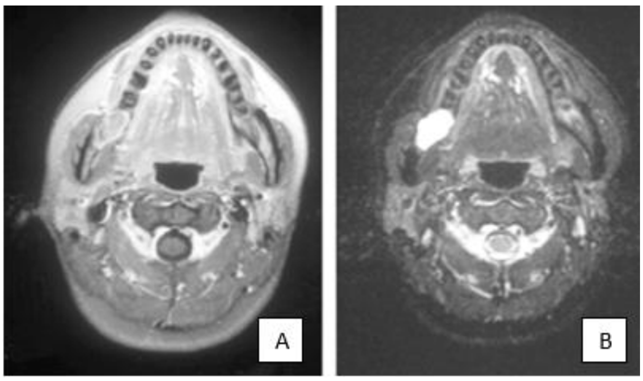

Figure10: (A) T1 image with contrast agent shows increased margin and walls, with slight intensification of the inner part of the cyst cavity. (B) Axial T2 image shows very high homogeneous signal intensity separated from the signal-free wall area [49].

Radiomics, or Computational Medical Imaging, is an innovative field that leverages digitized medical images to calculate and analyze various parameters. This technique aims to predict multiple aspects, such as the nature of a lesion or a tumor's response to treatment. In oncology, radiomics offers a significant advantage over biopsy, as it provides detailed insights into the anatomical, functional, and molecular characteristics of the entire tumor, including its surrounding environment [10].

A study by Z. Jiang et al. aimed to detect radiomic features of solitary maxillary bone cysts, which could aid in exploring new diagnostic strategies. Their research demonstrated that preoperative radiomic analysis can effectively distinguish solitary bone cysts from odontogenic keratocysts. Key radiomic features include the grey shadow, shape, intensity, texture, and spatial relationships of mandibular cystic lesions (Z. Jiang et al., 2023). For segmentation and extraction of regions of interest (ROI) (Figure 11), CBCT data from patients with solitary bone cysts (SBC) and odontogenic keratocysts (OKC) were processed using ITK-SNAP 3.2 software (Figure 12). This software offers both semi-automatic and manual segmentation, with easy navigation through the images. Supporting various 3D image formats, it enhances the accuracy and flexibility of radiomic analysis [10].

Three specific textural features: GLCM contrast, NGTDM contrast and GLCM variance can be used to characterise solitary maxillary bone cysts [10].

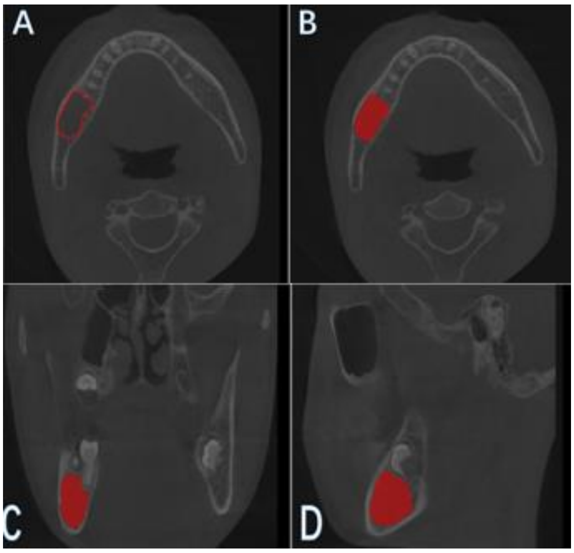

Figure 11: The results of area of interest (ROI) segmentation from CBCT images. (A) A ROI was manually delineated from CBCT images, (B) Axial plane, (C) Coronal plane and (D) Sagittal plane. The cyst is marked in red [10].

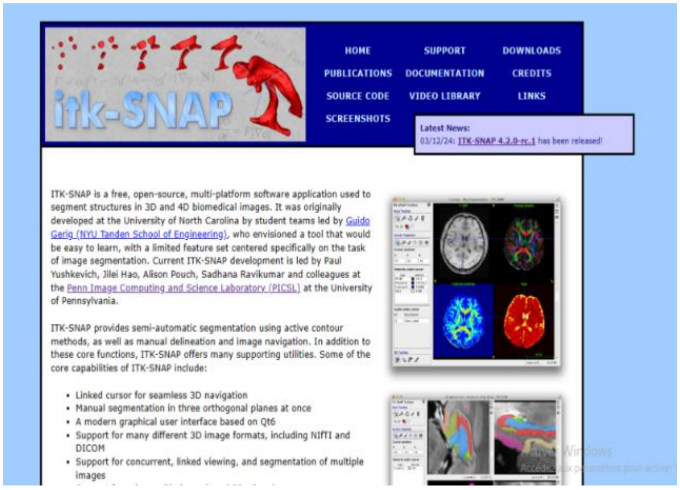

Figure 12: Screenshot showing the itk SNAP software (http://www.itksnap.org/)

Radiomics & artificial intelligence:

As CBCT has become more popular in everyday dental practice, this imaging modality is seen as an ideal data source for developing clinically practical AI tools to improve the accuracy and efficiency of diagnosis and treatment of maxillofacial diseases. According to a recent systematic review, the number of AI models developed from CBCT images for dento-maxillofacial applications has increased considerably over the years since the mid-2010s, thanks in particular to deep learning [52].

Radiomics, supported by artificial intelligence, represents a new approach for obtaining a positive diagnosis of a cyst without resorting to invasive surgical explorations. This method can be based on the analysis of three-dimensional images.

The originality of our review lies in the fact that little research has been carried out on our subject, and several questions have been asked and remained without clear answers concerning the positive diagnosis of solitary bone cyst based on preoperative three-dimensional radiography. Studies carried out to date still mention this difficulty in the preoperative evaluation of the positive diagnosis of solitary bone cyst, as well as the treatment modalities between a minimally invasive treatment and a conventional one.

The integration of three-dimensional radiography, in particular with CBCT cone beam, plays a crucial role in the diagnostic process. Together with a thorough analysis of the clinical features, this tool is fundamental in establishing an accurate preliminary diagnosis of the solitary bone cyst and devising an appropriate treatment plan. However, MRI provides a more reliable positive diagnosis to complement the clinical features.

In addition, recent approaches, including artificial intelligence (AI) and medical imaging, offer a non-invasive and accurate method, improving the prognosis and management of this type of lesion. The use of specific software for the segmentation of medical images, such as ITK-SNAP and 3D Slicer, as well as the development of digital surgery systems, can be of great help in clinical practice for the diagnosis and surgical planning of solitary bone cysts and other maxillary pathologies to ensure minimally invasive surgery. That said, while these emerging technologies offer promising potential, their integration into clinical practice remains exploratory and could represent a future perspective in improving the diagnosis and treatment of solitary bone cysts.

List of Abbreviations: SBC: Solitary Bone Cyst; CBCT: Cone Beam Computed Tomography; MRI: Magnetic Resonance Imaging; OKC: Odontogenickeratocyst; NAI: Inferior alveolar nerve; IA: Artificial Intelligence; GLCM: Gray-level co-occurence matrix; NGTDM: Neighborhood gray tone difference matrix; ROI: Region of interest

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