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(CASE REPORT)

The use of platelet rich plasma (PRP) and bone graft in surgical treatment of nasopalatine duct cyst: A case report

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Abstract

Background: The nasopalatine duct cyst is the most common non-odontogenic developmental cysts, also termed as incisive canal cyst. It was seen in 3-12% of operated cysts of the jaw with maximum incidences are seen in adult males. The cyst originates from epithelial remnants from the nasopalatine duct that may be activated spontaneously during life or are eventually stimulated by the irritating action of various agents (infection, etc.).

Purpose: The purpose of writing this article is to describe a treatment of nasopalatine duct cyst by surgery and application of bone graft accompanied with PRP.

Case: A 46-year-old male patient came with complaints of a lump on the roof of the mouth in for 4 months ago which was initially small but gradually enlarged. On intra-oral examination, a mass was seen in the midline region of the palate, round shape, 3 cm x 4 cm in diameter, and the same color as the surrounding tissue. The patient was diagnosed with nasopalatine duct cyst.

Case management: Cyst enucleation was performed under general anaesthesia. Post retrieval cyst wall defect reconstructed with xenogenic bone graft and covered with platelet rich plasma (PRP).

Conclusion: Enucleation with the application of bone graft and PRP in the treatment of nasopalatine duct cysts can provide a good surgical output.

Keywords: Bone graft; Nasopalatine duct cyst; Non-odontogenic cyst; Platelet rich plasma

1. Introduction

Meyer was the first to describe a nasopalatine duct cyst in 1914. The term "cyst of the palatine papilla" refers to a cyst that develops in the soft tissues of the palatine at the canal's opening. More people use the term "nasopalatine duct cyst" than any other synonym. It is situated above the retroincisor palatal papilla on the palatal surface of the maxillary midline. The epithelial remains of the oro-nasal ducts within the incisive canals give rise to a nasopalatine duct cyst. Between the fourth and sixth decades of life, the majority of cases take place. Males are known to have a 3:1 prevalence compared to females. There was no discernible relationship between the patient's gender and the lesion's size [1,2,3,4,5]. It is suggested that the epithelial remains of paired embryonic nasopalatine ducts within the incisive canal give rise to nasopalatine duct cysts. Infection (38%), local trauma (16%), mild mucus retention in the saliva,

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inflammatory stimulation, spontaneous growth of the epithelial remains in the nasopalatine ductus, and idiopathic origin are the etiological causes [6].

Although the majority are asymptomatic and typically detected in regular clinical and imaging examinations, it might clinically manifest as painful sensations, oedema, and purulent discharge. A well-defined unilocular radiolucent in the midline with a round, oval, or heart-shaped image is what a nasopalatine duct cyst looks like on radiography. Since the cyst and the apical of the upper anterior teeth are closely related, there may be concerns about the possibility of diagnosing inflammatory periapical lesions (like granuloma or radicular cyst). To rule out these diagnostic possibilities, supplementary tests like the pulp vitality test must be conducted. Clinical, radiographic, and histopathologic results should be used to provide a definitive diagnosis of the cyst [7, 8].

Large alveolar bone deficiencies may result from the enucleation procedure used to treat nasopalatine duct cysts, which can grow to considerable sizes. One important bioactive scaffold in regenerative dentistry is platelet-rich plasma (PRP). PRP affects wound healing and bone remodelling due to its diverse range of growth factors. In order to stimulate cell growth into the target tissue, PRP can also be mixed with carbonate apatite material to create a bone graft. This material will then attach to the proteins required for the formation of new tissues. With the chemical formula Ca10(PO4CO3)6(OH)2, apatite carbonate also promotes the formation of new bone and speeds up the differentiation and proliferation of osteoblasts [9,10]. This case report will present the management of nasopalatine duct cyst with enucleation and a combination of PRP with carbonate apatite to prevent post-treatment complications.

2. Case Report

A 45-year-old male patient came with chief complaint of swelling in the anterior of the palatine. For the past four months, the swelling has been steadily getting bigger without causing the maxillary central incisors to move. There was no history of trauma linked to it. Extraoral examination revealed no abnormalities. An intraoral examination showed a distinct enlargement that measured around 30 by 40 mm (Figure 1). On palpation the swelling was regular and covered by normal appearing mucosa, non-compressible, soft in consistency, non-pulsatile, fluctuant, non-tender, and no fluid discharge. Lymph nodes were not palpable.

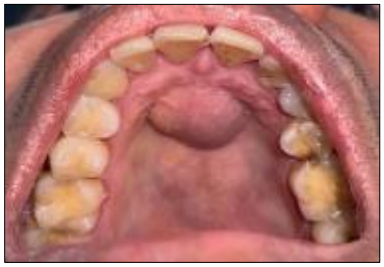

Figure 1 Preoperative intraoral swelling

A well-defined circular radiolucency in the midline of the front maxilla between the roots of the central incisors was visible in the maxillary occlusal radiological view (Figure 2). No indication that the tooth roots have reabsorbed. A preliminary diagnosis of nasopalatine duct cyst was made based on radiological and clinical findings.

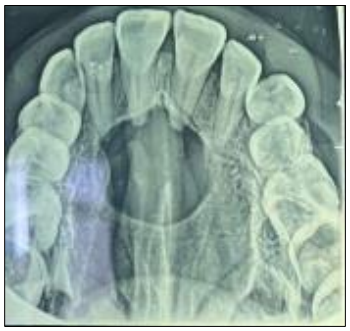

Figure 2 Maxillary occlusal view showing well defined radiolucency in the anterior maxilla

3. Case Management

Under general anesthesia, aspiration of the lesion fluid and enucleation were performed. The incision was adapting the usual palatal approach with a sulcular incision (Figure 3A). Enucleation of the lesion followed by aggressive curettage (Figure 3B). Endodontic therapy was previously performed with respect to 11,12,21 and 22. Apicoectomy of respective teeth 11 and 21 were done. Mineral Trioxide Aggregate (MTA) was placed in the root apices. Membrane was placed inside bone cavity. The next step is the application of cyst wall defect reconstructed with xenogenic bone graft and covered with platelet rich plasma (PRP) (Figure 3C). Surgical site was closed with vicryl by placing interpapillary sutures. The specimen was sent for histopathological examination fixed in 10% formalin (Figure 3D).

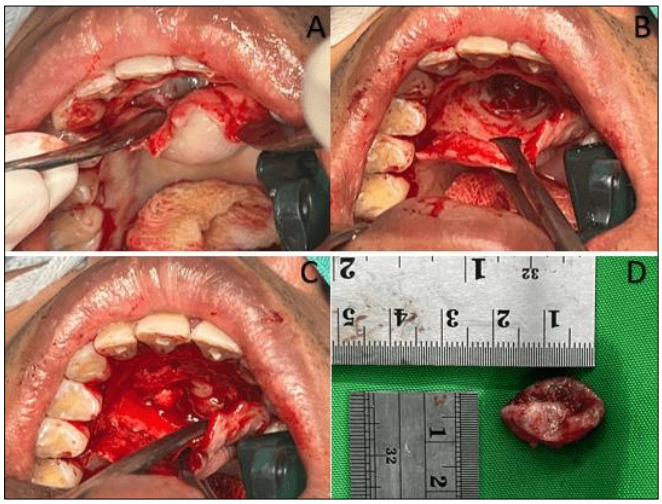

Figure 3 A: Incision for enucleation is an envelope flap with a sulcular incision from the right second premolar to the left second premolar; B: Defect after the cyst has been enucleated; C: application of cyst wall defect reconstructed with xenogenic bone graft and covered with platelet rich plasma (PRP); D: Specimen

After 2 weeks of this treatment, it could be seen on second radiograph the same-shape image previously seen, however the second image had disappeared. A second maxillary occlusal radiograph showed the radiolucency in the midline of the upper jaw was still presents although an improvement of the lesions was noticed. Intraoral examination showed that the swelling had disappeared, and the palatal mucosal structures appeared to be normal.

The microscopic examination showed a fibrous wall partially lined by stratified squamous epithelium and partially lined by pseudostratified ciliated columnar epithelium. In the cyst wall, there were not many blood vessels, nerve bundles, or mucous cells (Figure 4).

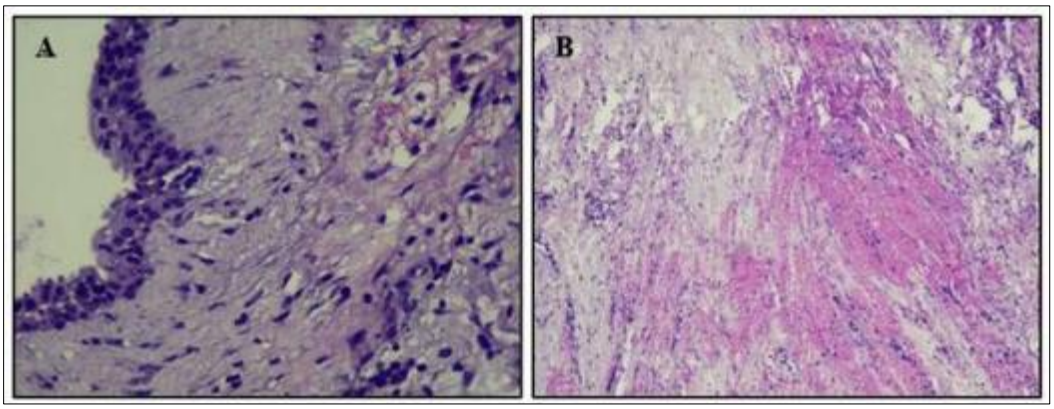

Figure 4 Histopathological examination of specimen showing pseudostratified ciliated columnar epithelium and partly by stratified squamous epithelium (hematoxylin-eosin at A.400x and B.100x magnification)

Periodic follow-up was done. On 2 years follow-up, the patient had no complaints and the palate has fully healed.

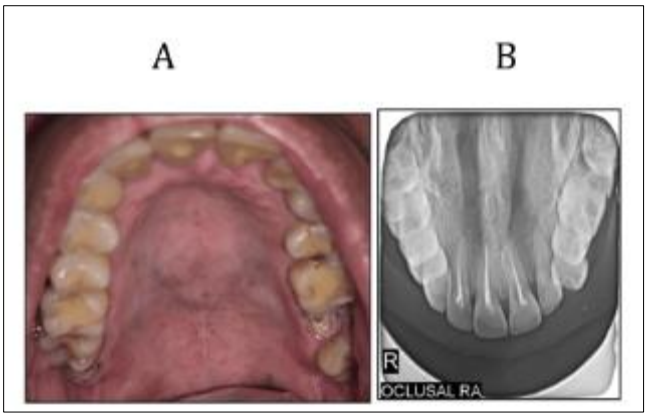

Figure 5 Follow-up 2 years after surgery. **A**: Intraoral aspect of the patient; **B**: Maxillary occlusal radiographic photo

4. Discussion

The embryonic remnants of the nasopalatine duct, which is destroyed at birth, as well as the nasopalatine nerve and blood vessels are typically found in the nasopalatine canal, which is a channel through the hard palate. Initially, it was believed that nasopalatine duct cysts originated from the epithelium trapped during the fusing of the three processes that make up the palate, but the exact cause remains unknown. According to some writers, remains of embryonic epithelial tissue in the nasopalatine canal spontaneously proliferate, resulting in nasopalatine duct cysts. In terms of pathophysiology, a number of causes, including trauma, infection, genetic predisposition, and spontaneous onset, have been hypothesised to contribute to this proliferation and the formation of a nasopalatine duct cyst; however, none of these could be definitively proven. Given the discovery of cysts in human foetal nasopalatine ducts, it was also proposed that spontaneous cystic degeneration of epithelial rests [11].

As the nasopalatine canal descends to leave the incisive foramen, the cell types inside the canals vary. Squamous epithelium, ciliated pseudostratified columnar epithelium, cuboidal epithelium, or a mix of these histological types line the nasopalatine duct cysts under a microscope. According to histology, respiratory epithelial cells are found in the upward sections of the canals close to the nasal area. The lining of the canal has cuboidal cells as it descends. Squamous cells can be found close to the mouth. Furthermore, the canals include glands that secrete mucus. These canals also contain the branches of the sphenopalatine and descending palatine arteries. Although the nasopalatine cells degenerate, the mucous-secreting and epithelial cells that remain may provide the groundwork for a nasopalatine duct cyst [12,13].

Surgical enucleation is the preferred treatment for nasopalatine duct cysts; for bigger cysts, marsupialization may be necessary. The nasopalatine neurovascular bundle is a highly vascularised structure that is located next to the nasopalatine duct cyst. If it is accidentally sectioned during surgery, it may result in extensive bleeding. The removal of the cyst membrane and nasopalatine nerve terminals causes paraesthesia in the anterior palate region in 10% of instances [14].

PRP and bone grafts work well together to treat post-enucleation nasopalatine duct cyst deformities. The impression of new bone development in the post-enucleation defect appeared radiopaque during the second week of the OPG test. This demonstrates that within two weeks, PRP and bone graft treatment can initiate defect healing. The local release of several growth factors, such as platelet derived growth factor (PDGF), insulin-like growth factor-I (IGF-I), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and endothelial growth factor (EGF), which are involved in the process of reparative osteogenesis, explains why PRP is used to treat post-enucleation defects. IGF-I boosts protein synthesis and encourages bone production because of osteoblasts and their proliferation and differentiation, whereas PDGF supports angiogenesis, collagen synthesis, macrophage activation, and bone cell proliferation. EGF leads to DNA synthesis, which increases the expression of certain genes by binding to the epidermal growth factor receptor (EGFR); VEGF is responsible for vasculogenesis and angiogenesis; TGF-β can induce bone matrix deposition, promote extracellular matrix production, enhance fibroblast proliferative activity, and inhibit osteoclast formation and bone resorption. After being released from platelets, PRP growth factor attaches itself to receptors on the surface of target cells that are expressed on mesenchymal stem cells. This triggers signalling pathways that can either promote or hinder cell proliferation and differentiation [9].

Patients with damaged bone tissue have had surgery using bone grafts. A scaffold that will serve as a replacement for the microenvironment lost during the process of bone tissue destruction or loss is required in injured bone tissue. The proper bone graft will aid in cell recruitment and act as a bridge for any gaps in damaged or lost tissue, facilitating the movement of nutrients, blood circulation, and other materials required for tissue regeneration and growth acceleration. It also serves the purpose of creating a microenvironment that is appropriate for the lost tissue. In order to prevent the immunological reactions that frequently happen when employing allografts and xenografts, carbonate apatite, the primary component of human bone, is generated synthetically yet is identical (same and congruent). An inflammatory process comes before the creation of bones. Fibroblasts and inflammatory cells penetrate the damaged area at the cellular level. In order for the fractured area to acquire enough oxygen and nutrients, inflammatory cells and osteoblasts infiltrate the area, causing granulation tissue to develop and encouraging vascular expansion and mesenchymal cell migration. On the surface of bones are cells called osteoblasts, which are produced from osteoprogenitor cells and form new bone. These cells are in charge of bone mineralisation and formation. Osteoblasts contribute to the process of bone mineralisation by producing collagen and glycosaminoglycans from the bone matrix. Because immature bone is composed of numerous osteocytes, has a low mineral salt concentration, and manifests as an uneven plait of collagen fibres, it lacks physical strength [10].

5. Conclusion

Enucleation with the application of bone graft and PRP in the treatment of nasopalatine duct cysts can provide a good surgical output.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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