A clinical study on oroantral fistulae

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SUMMARY. The report presented is an analysis of 98 patients with an oroantral fistula (OAF). The tooth most frequently involved was the upper second molar, followed by the first molar. The highest incidence was seen in the fourth and third decades of life and the lowest incidence in the second decade. In this study, intercurrent sinusitis was the most obvious cause of the chronic oroantral communication. The closure of OAF is one of the more challenging problems in oral surgery. Long-term successful closure of OAF depends on the technique used, the size and location of the defect, and on the presence or absence of sinus disease. Among the several techniques proposed for treatment of OAFs, in the majority of cases, the buccal advancement flap technique was used in this study. The advantages and limitations of the technique are discussed.

INTRODUCTION

Oroantral communication and subsequent formation of an oroantral fistula (OAF) is a common complication of dental extractions. Owing to its anatomical location and intimate relationship with the teeth, the maxillary sinus occupies an important place in oral and maxillofacial surgery. From a small cavity at birth, the maxillary sinus starts to enlarge during the third month of foetal life and usually reaches maximum development around the eighteenth year. Its volume is approximately 20-25 ml in a normal adult. The floor of the sinus consists of the alveolar process and the hard palate. The roots of the maxillary premolar and molar teeth are in close proximity to the sinus and those of the second premolars and those of the first molars may be observed within it. Schaeffer (1910) and Mustain (1933) reported that the second upper premolars have the most intimate relationship with the maxillary sinus. The study of Von Bonsdorff (1925) revealed that the second molars are in close proximity to the base of the sinus. However Killey and Kay (1967), Von Wowern (1971), Ehrl (1980) and Punvutiikorn et al. (1994) have shown that removal of the first molars is the most common aetiological factor in OAF. OAF is an abnormal communication resulting most frequently from extraction of the upper posterior teeth. The authors have seen a considerable defect produced when premolars and molars together with the surrounding bone were removed en bloc during an excessively traumatic extraction (McGovan et al., 1993; Güven, 1995) (Fig. 1).

Many techniques have been proposed for the closure of OAF, including buccal or palatal alveolar flaps and their modifications. The preferred technique may vary from one clinic to another, depending upon past experience. In addition to the above mentioned techniques, the use of some alloplastic materials has also been proposed Materials ranged from autogenous bone grafts (Proctor, 1969) to gold foil (Goldman et al., 1969). With advancing technology, dura mater and fascia lata, as examples of allotransplants, have also been used for closing OAF (Güven, 1995). In recent years, the use of a pedicled buccal fat pad in closure of large oroantral openings has become popular (Hanazawa et al., 1995). Attempts to close larger defects caused by severe trauma or tumours by local flaps may lead to failure. Distant flaps from the extremities or forehead (Edgerton and Zovickian, 1956) or tongue flaps (Guerrero-Santos and Altamirano, 1966) have been described earlier. Successful closure of OAF is dependent on the absence of pathology within the sinus and a proper surgical technique. In this study, the clinical course and treatment aspects of OAF will be presented.

PATIENTS AND METHODS

The survey is based on 98 patients treated by the author between 1983 and 1997. The factors considered were sex, age, cause of the OAF, incidence and
mode of treatment. The χ² test was used to establish the correlation of OAFs in each group to tooth, aetiology, and site of 98 patients in the study, 52 (53.06%) were female and 46 (46.94%) male (Fig. 2). The age distribution of the patients is shown in Fig. 3. The majority were found in the 31–40 age group ($P<0.001$). The distribution of the cases according to aetiology was highest in those involving tooth extraction (78.60%) (Fig. 4). The most notable feature in the study group was the presence of pathology (hypertrophic, oedematous mucosa or polyps) within the sinus, detected by radiography ($P<0.001$) (Fig. 5). Thirty-five patients under our care had been previously treated elsewhere by other techniques and the remaining 63 had had no previous treatment. The highest incidence of OAF was found after extraction of a second premolar (28.57%) ($P<0.001$), followed respectively by the first molar (26.53%) and first premolar (22.45%) (Fig. 6).

RESULTS

In our study, we treated most of the cases (90.82%) using Rehrmann's buccal advancement flap technique (BAF) (Fig. 7). In addition, five (5.10%) were treated using a palatal flap (PF) (Fig. 8) and four (4.08%) by a sliding bridge flap (SBF) (Fig. 9). Figure 10 shows the distribution of the techniques used in the study. In two of the patients (2.04%), anaesthesia of the infraorbital nerve was observed postoperatively and disappeared in time. In six cases (6.12%), the diminution of vestibular sulcus height was permanent while the others were temporary and it disappeared in the following weeks. Three out of 98 cases (3.06%) needed resuturing due to the failure of the original sutures. In two cases, granulation tissue developed in the suture line and it was treated by local debridement and resuturing. In three cases, neighbouring teeth
were extracted during the operation and before closure of the OAF due to weak support of the alveolar bone (Fig. 11).

**DISCUSSION**

Review of the literature as well as our findings demonstrates that OAF usually occurs after the third decade of life; this is in close agreement with the reports of other investigators (Lin et al., 1991; Punwutikorn et al., 1994). Elderly patients with few maxillary teeth appear to have larger sinuses than younger individuals. In our series, the highest incidence was found in the 31-40 years age group. However, there was no statistically significant difference in the other age groups. The risk of occurrence of OAF in children is reduced because of the relatively small sinus cavity. None of the patients in this study was younger than 11 years old.

The frequency of occurrence of OAF was nearly the same in both sexes, which correlates with the findings of (Von Wüern, 1971; Skoglund et al., 1983; Punwutikorn et al., 1994). However, according to (Lin et al., 1991), females exhibit larger sinuses than males and should, therefore, be at greater risk of OAF.
The results of the present study were similar to those of previous studies by Killey and Kay (1967), Von Wowern (1971), Punwutikorn et al. (1994) and Hanazawa et al. (1995), who also reported that the most frequent cause of the OAF was tooth extraction. We found that dentoalveolar infections, cysts, tumours and trauma were other frequent causes. In this study, the highest incidence of OAF was found after extraction of a second premolar followed by the first molar. However, there was no significant difference in the incidence of OAF between the extraction of premolars and first molars.

In a study of 104 oroantral communications, Von Wowern (1971) concluded that the chance of spontaneous healing was small, and that therefore closure of a perforation is frequently needed. In contrast to this study, we have found that no such closure was needed in cases where the sinus was healthy and the cavity small. The aim was to provide support for the blood clot in the socket so that it will organize, be replaced by bone and epithelialize on its oral and antral surfaces. The clot in the cavity should be protected with a gauze sponge dressing for 48 h. A figure-of-eight wire or an acrylic splint may also be applied for additional support to healing of the tissues. Furthermore, the patient should be motivated to avoid intraoral negative pressure such as blowing the nose and to use antibiotics for prophylaxis.

Our study revealed that the high incidence of chronic sinusitis or antral polyps may be the most commonly associated cause of OAF formation. Otherwise, in a case with a healthy sinus wall and mucosa, the opening of the sinus will repair spontaneously following injury caused by tooth extraction. Also the length and width of the extraction socket is of importance. Shorter and wider extraction sockets are unfavourable to spontaneous closure. In the present study, the clinical diagnosis of chronic sinusitis was always confirmed by radiographic examination. The surgical treatment of cases with chronic sinusitis involved a classical Caldwell-Luc procedure. Because of its reliability and straightforward nature, the easy surgical technique of buccal advancement flap (BAF) was the most frequently used for the closure of OAF. Other techniques were used much less frequently (Fig. 10). In our study a palatal flap (PF) was preferred in the cases who had reduced depth of the buccal sulcus due to an unsuccessful previous attempt at closure of an OAF. A sliding bridge flap (SBF) was used in cases which were totally edentulous and had a reduced sulcus depth due to alveolar resorption. Mucoperiostium overlying an edentulous ridge in the vicinity of the fistula has been utilized in the form of a SBF. Buccal vestibular sulcus height was not affected in those cases. The BAF has been criticized by some authors, for example, Von Wowern (1982) and Zide and Karas (1992) because of the postoperative decrease in sulcus depth. However, it has a broad base, which ensures an adequate blood supply to the flap. The flap mobility is improved by making a parallel incision in the periostium at the base of the flap (Rehrmann, 1936) (Fig. 7). Although there is an argument that this method reduces the depth of the buccal vestibular sulcus, the studies of Rehrmann (1936), and Eneroth and Martensson (1961) showed this to be a temporary problem. These authors used study models from alginate impressions before and after surgery which showed that the decrease in depth present at 2 weeks had disappeared after about 8 weeks. All of the cases in this study treated by BAF healed almost uneventfully and none needed vestibuloplasty later on. Therefore, it can be concluded that BAF is a conventional, simple and well tolerated technique for patients with an oroantral fistula, provided that any type of chronic sinusitis has been properly treated.
References


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