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Research Article

Evolution of Free Non-Vascularized Bone Graft in Mandibular Reconstruction

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Abstract

Objective: Report our experience with the use of free Non-vascularized Bone Graft and study the evolution of these grafts in our service to improve our patients care.

Material and Methods: A retrospective study of patients who underwent mandibular reconstruction with free Non-vascularized Bone Graft to a mandibular benign tumor, between January 1995 and December 2014.

Results: The study focused on 45 patients, 18 men (40%) and 27 women (60%). The average age was 26 years (4-46 years). The symptoms leading to consult was swelling in 45 cases (100%). The panoramic radiograph showed bone lysis with polycyclic contours in 29 cases (64%), unikystic appearance in 14 cases (31%), and osteocondensation in 2 cases. The surgical approach was mixed for 35 patients (78%), endobuccal for 2 patients (4%), and external for 8 patients (18%).

The reconstruction was immediate for 42 patients and delayed in 3 cases. The type of graft used in the reconstruction was the iliac crest in 41 cases, and arthrocostal in 4 cases.

Histology confirmed the diagnosis of an ameloblastoma in 49% of cases, a fibroma in 22% of cases, a fibrous dysplasia in 10% of cases, and a cyst in 15% of cases. The postoperative evolution was marked by an appearance of a pleural breach without pneumothorax for one patient, 9 graft infections, bone resorption of infectious origin for 5 patients, and 2 cases of fistula secondary to an infection.

The evolution in the medium and long term with a decline of 4.5 years showed excellent morphological results for 10 patients (28%), average results for 23 patients (66%) and a poor result in 2 cases (6%). Chewing was good for 60% of patients, both of phonation and swallowing were correct for all patients and there were complete graft resorptions for 5 patients.

Conclusion: The use of free Non-vascularized Bone Graft is a viable treatment option for the mandibular reconstruction after resection of a benign tumor. We recommend that treatment in our context for its satisfactory results.

Keywords: *Benign tumor of the mandible; Non-vascularized Bone Graft; Reconstruction; bone resorption; infection*

Introduction

The mandible is a horseshoe-shaped bone that forms the lower third of the face skeleton. It has an important function in speaking, chewing and aesthetics, which requires rebuilding its continuity during an interrupter surgery to restore both of its appearance and function.

Mandibular reconstruction has recently involved, and various options have been reported in the literature: Xenograft and allograft (vascular and nonvascular) [1-3]. Recently, distraction osteogenesis, genetically modified bone have been recommended [4-6], but the high costs of these new treatment modalities limit its use in developing countries. The nonvascular bone is a useful alternative in mandibular reconstruction after resection of benign tumors [1,7,8]. Recommended in low-income countries where the new procedures are not practiced due to costs and limited experience. Donor sites such as the scapula, chondrocostal area, clavicle and fibula have been described [1,4,9], but the majority of the authors however prefer the bone from the iliac crest in the reconstruction because it provides adequate bone mass [1,6,8,9]. A study of the biomechanical properties of the iliac crest has shown that the constraints distribution of the iliac crest is similar to that of the mandible [8].

Although the literature is rich concerning the free vascularized bone grafts evolution in mandibular reconstruction [3,4,9,10] there is a shortage of studies on this subject in moroccan literature.

The objective of this study is to report our experience with the use of free Non-vascularized Bone Graft and to study the evolution of these grafts in our service to improve our patients care.

Material and Methods

We made a retrospective study of patients who underwent mandibular reconstruction with Non-Vascularized Bone Graft, between January 1995 and December 2014.

All patients with benign tumor of the mandible requiring surgical management with interruption of continuity and reconstruction with free non-vascularized bone graft, within our training, were included.

We excluded from our study patients with benign tumors who didn't have an interrupting surgery, patients with other etiologies also requiring continuity interruption of the mandible such as malignant tumors and patients with unusable files.

Results

The study focused on 45 patients, 18 men (40%) and 27 women (60%). The average age was 26 years (4 - 46 years). The time limit before the consultation was varying from 2 months to 15 years, with an average of 4 years. The symptoms leading to consult were swelling in 45 cases (100%), pain in 8 cases (18%), mobility or loss tooth in 10 cases (22%), and limited mouth opening in 6 (13%).

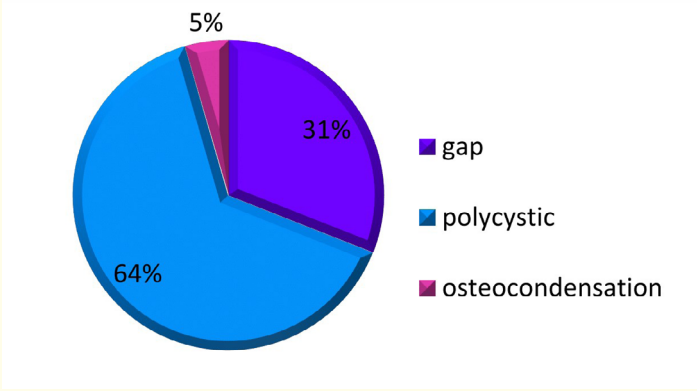

Figure 1: *The panoramic radiograph of our patients.*

The panoramic radiograph showed bone lysis, with polycyclic contours, finely cloisonne in 29 cases (64%), a unikystic appearance in 14 cases (31%), osteocondensation in 2 cases (Figure 1), a soft tissue involvement in 13%, we have also noted a dental inclusion in 2 cases. Cortical lysis was found in all patients who we realised in a computed tomography.

The surgical approach was mixed in 35 patients (78%), endobuccal in 2 patients (4%), and external in 8 patients (18%).

The reconstruction was immediate in 42 patients and delayed in 3 cases. The type of graft used in the reconstruction was the iliac crest in 41 cases, and chondrocostal in 4 cases.

Histology confirmed the diagnosis of ameloblastoma in 49% of cases, fibroma in 22% of cases, fibrous dysplasia in 10% of cases, a cyst in 15% of cases, pseudo inflammatory cyst, and shwannoma in 2% of cases (Figure 2).

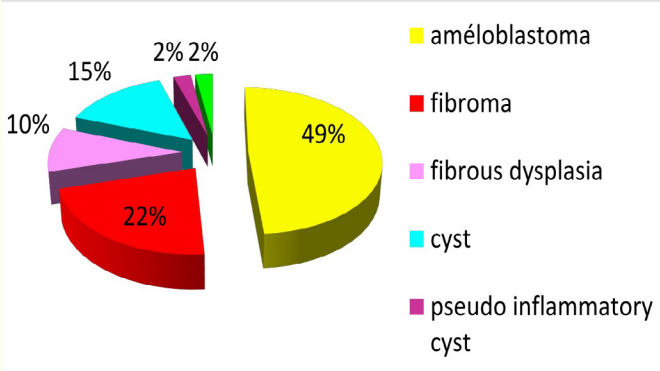

Figure 2: *Histological result of our patients.*

The postoperative course was marked by the appearance of a pleural breach without pneumothorax in one patient, 9 infections on graft [two local controlled (4%), 7 cases with clinical and radiological impact (17%)], bone resorption with infectious origin in 5 patients (3 cases with lateral deviation of the mandible, and 2 cases with bone sequestration), and 2 cases of cutaneous fistula secondary to infection (Figure 3).

Figure 3: *Appearance of a fistula secondary to an infection.*

The evolution in the medium and long term with a decline of 4.5 years (4 months - 12 years) was marked by 10 lost to follow-up. For the other 35 patients, the morphological results are described by Beziat classification, were found excellent results for 10 patients (28%) (Figure 4 and 5), average results for 23 patients (66%) (Figure 6) and a poor results in 2 cases (6%) (Figure 7). Chewing was good in 60% of patients, phonation was correct for all patients and swallowing was normal. There was a total resorption of the graft in 5 patients (Figure 8), poorly tolerated with reconstruction in 4 cases.

Figure 4: *Excellent clinical (left) and radiographic (right) results after 3 years.*

Figure 5: *Excellent clinical (left) and radiographic (right) results after 5 years.*

Figure 6: *Clinical (left) and radiographic (right) average results after 5 years.*

Figure 7: *Bad result after 3 years.*

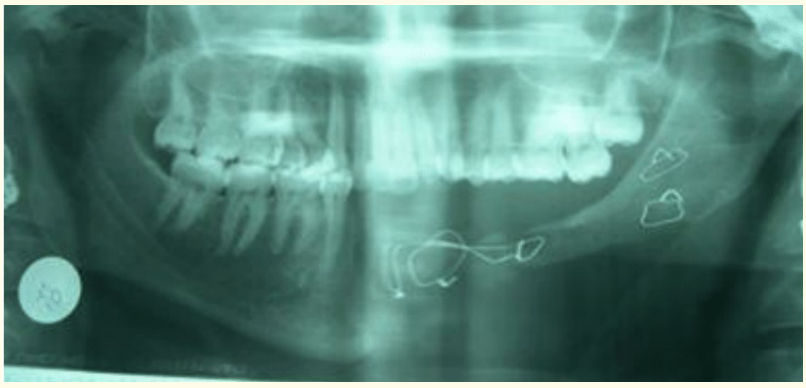

Figure 8: *Total graft resorption after 3 years.*

Discussion

Treatment of mandibular benign tumors often require resection of a bone segment with interruption of continuity, affecting speech, mastication and esthetics of the patient. Therefore, a mandibular reconstruction is needed.

The goal of the mandibular reconstruction is to reestablish bone continuity and contour to restore mandibular functions. In this study the continuity and aesthetics were judged satisfactory by 94.2% of patients, which is concordant with the literature where the rate of the successful reconstruction was between 38 and 100% of cases [1,3,11].

Recent works on the mandibular reconstruction agree that non-vascularized bone grafts are best suited for the reconstruction of segmental defects created after excision of benign tumors [12,13]. It should be noted that the iliac crest can be used in all clinical situations, including cases of major discontinuity defects of the mandible, as it provides a high and adequate volume to optimize facial contours and prosthetic rehabilitation [14]. It was also shown that the extent of resection was not a limit to the use of Non-vascularized Bone Graft, the

only restriction to non-vascular bone grafts appears to be represented by inadequate quality and a quantity of soft tissue sur-rounding the graft [15].

Rigorous follow-up the of non-vascularized bone grafts evolution allows to seek short, medium and long term complications.

The incidence of the graft infection is about 20% in our study, this figure is in agreement with the figures reported in the literature, the infection rate is 20-36% according to studies [12,16]. Factors such the operation duration, the oral flora, the intraoperative contamination and the interval between the graft harvesting and its placing contributed on the infection graft incidence [3,9,17]. All patients in this study had postoperative antibiotic therapy for a week and the surgical drains were removed 48 hours after the operation. Egyedi., *et al*. [18] recommended a complete cycle of 10 days intravenous antibiotics therapy to prevent infection.

Other types of complications can be observed in the short term as an appearance of an hematoma that requires adequate haemostasis, evacuation and an antibiotic therapy to prevent infections. Becelli reported a facial nerve injurie manifested by a paresis which is caused by an hematoma or a bone fragment compression in 11% of cases [19]. In our work, we haven't found any facial injury, however we found 2 cases of fistula secondary to infection.

Otherwise, the major drawback of the mandible reconstruction with free non-vascularized bone grafts is a constant bone resorption, but with varying degrees. That bone resorption is accelerated by infection, minimal spongy component and bad immobilisation. The bone resorption is also influenced by the resection seat (symphysis is less vascularized) and the soft tissues vascularization. In our study, we found excellent results for 10 patients (28%), average results for 23 patients (66%) and poor results in 2 cases (6%). A total resorption of the graft was observed in 5 cases but only after a 4 - 5 years duration. Akbay didn't note graft resorption on the computed tomography after six months monitoring period [20], and Chiapasco found excellent bone graft integrations in the bed of the receiver and a high survival rate (96.7%) after a relatively long observation period (94 months) [19].

Conclusion

The use of a free non-vascularized bone graft is still relevant and is a viable treatment option in the mandibular reconstruction after resection of a benign tumor. A planning, a precise surgery and a good monitoring have contributed to the high success rate. We therefore recommend to use the free non-vascularized bone graft in our context.

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