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The coronoid process as a new donor source for autogenous bone grafts for reconstructing orbital and midface defects

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SUMMARY

Reconstructing orbital or midface defects by means of autogenous bone graft is a question of a well suited donor area. Several approaches in harvesting bone grafts from the calvarian or the illiac crest demonstrated that the grafts did not fit in shape or thickness. Also, the retromolar region as a donor area lead to structural loss of stability with the risk of spontaneous fractures of the mandible. Therefore, we present a new technique of harvesting an autogenous bone graft from the lateral cortical layer of the coronoid process. This region is a well suited donor area because of its easy accessibility, the good shape and thickness of the graft and its corticocancellous nature.

KEY WORDS:

Coronoid process, autogenous bone graft, orbita, midface defects.

SOMMAIRE

La reconstruction des pertes de substance des régions orbitaires et centro-faciale à l'aide de greffes d'os autologue dépend du site adéquat du prélèvement. Diverses tentatives de prélever des greffons osseux à partir des os du crâne ou de la crête iliaque ont démontré que ces greffes ne peuvent pas convenir à cause de leur taille et de leur épaisseur. Prélever un greffon à partir de la région rétromolaire conduit à une perte de structure et de stabilité avec comme conséquence une fracture spontanée de la mandibule. C'est ainsi que nous présentons une nouvelle technique en recueillant un greffon d'os autologue à partir de la couche corticale du processus coronoïde. Cette région convient bien comme territoire donneur étant donné la facilité de son accès, la forme et l'épaisseur adéquate du greffon ainsi que sa nature corticale.

MOTS CLÉS:

Processus coronoïde, greffe d'os autologue, orbite, défectuosités de la région centro-faciale.

INTRODUCTION

The occurrence of enophthalmus, limited movement of the bulbus and diplopia are frequent reasons for exploration of the orbital floor. Depending on the clinical situation, various treatments are suggested for the reconstruction of orbital floor fractures. The treatment is a compromise between elevating the

orbital tissue (Livingston et al. 1975) and reconstruction with bone, cartilage or alloplastic materials like micromesh (Converse et al. 1967, Rankow and Mignogna 1975, Ianetti and D'Arco 1977, Roncevic and Maligner 1981, Bagatin 1985, Irby 1974, Rowe and Killey 1968, Miller and Morris 1972, Freeman 1962, Capodanno 1967).

Although alloplasts are useful materials, bony reconstruction of such defects might be physiologically preferable. Sources of autogenous bone for grafting are the iliac crest, the rib and the calvarian bone.

Although bone from these regions yield satisfactory results, the major disadvantage is the necessity for an additional operative procedure which increases the morbidity and the possibility of intra and postoperative complications. In some cases, the harvested bone is too thick and bending the bone leads to multiple factures of the graft. This problem has made the reconstruction of orbital floor defects by means of bony reconstruction a question of necessity rather than choice. With the knowledge of this difficult situation we looked for a new donor region for autotransplantable bone for the reconstruction of orbital floor and midface defects. The lateral cortical layer of the coronoid process is a well suited bony transplant and in addition to that it can be reached easily.

The lateral plate of the coronoid process is an excellent donor for the use of autotransplanted bone to avoid morbidity and complications.

The region is especially well suited because of its accessibility, cortiocancellous nature and as a major point the contour and the thickness of the transplant.

The aim of this paper is to present a new method for the reconstruction of orbital floor and midface defects.

TECHNIQUE

The autogenous graft from the left or/and right lateral cortical plate of the coronoid process is used for rebuilding the orbital floor and the infraorbital rim. It might be also used for rebuilding the nasal bone (Fig. 1-8).

For this purpose an incision is made in the retromolar region which extends from the end of the coronoid process to the posterior edge of the second molar.

The lateral region of the posterior coronoid process is exposed by the preparation for harvesting the graft. Using the microburr (Fig. 7), bone cuts are made through the lateral coronoid cortical layer (Fig. 6-8). A large osteotome is used to mobilize the graft from the donor region.

The graft is placed on a saline soaked sponge. The incision is closed. Usually there is no necessity of contouring the graft because the shape of the lateral cortical coronoid plate is approximately of the same contour as the orbital floor or the paranasal bone. It usually fits perfectly (Fig. 10, 13-17). The graft might be stabilized with microlag screws if necessary.

Fig. 1: Aspect of the donor site of ramus ascendens in a cadaver.
Fig. 1: Aspect du site donneur de la branche montante sur le cadavre.

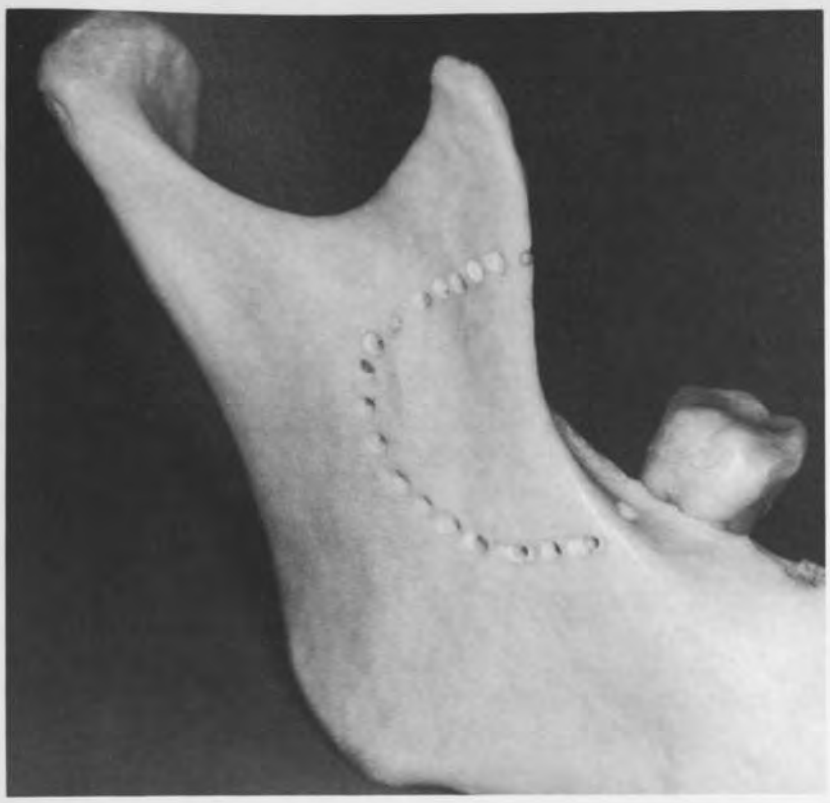

Fig. 2: Lateral aspect of the ramus ascendens with bone cuts through the lateral cortical bone of the coronoid process.
Fig. 2: Vue latérale de la branche montante avec la découpe au travers de l'os cortical latéral du processus coronoïde.

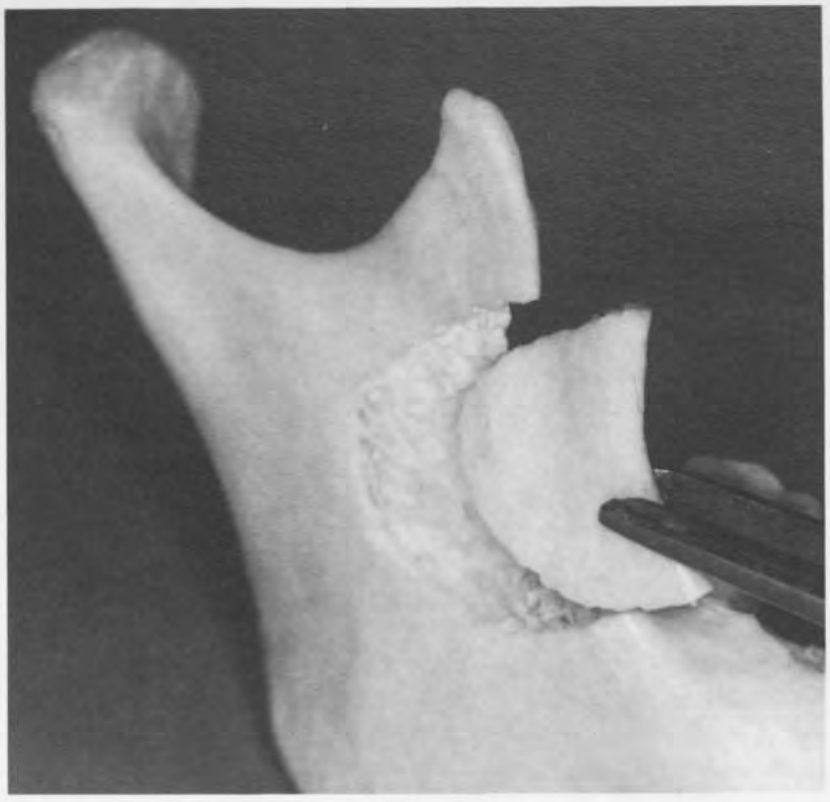

Fig. 4: The donor site of bone autograft from the coronoid process.
Fig. 4: Le site donneur du greffon osseux à partir du processus coronoïde.

Fig. 3: Frontal view of the ramus ascendens with aspect of the donor site.
Fig. 3: Vue frontale de la branche montante avec l'aspect du site donneur.

Fig. 5: The donor defect of the coronoid process.
Fig. 5: Le défect au niveau du site donneur.

Fig. 6: Aspect of the donor site of ramus ascendens for reconstruction of paranasal bone defects.
Fig. 6: Aspect du site donneur de la branche montante pour la reconstruction des défects osseux paranasaux.

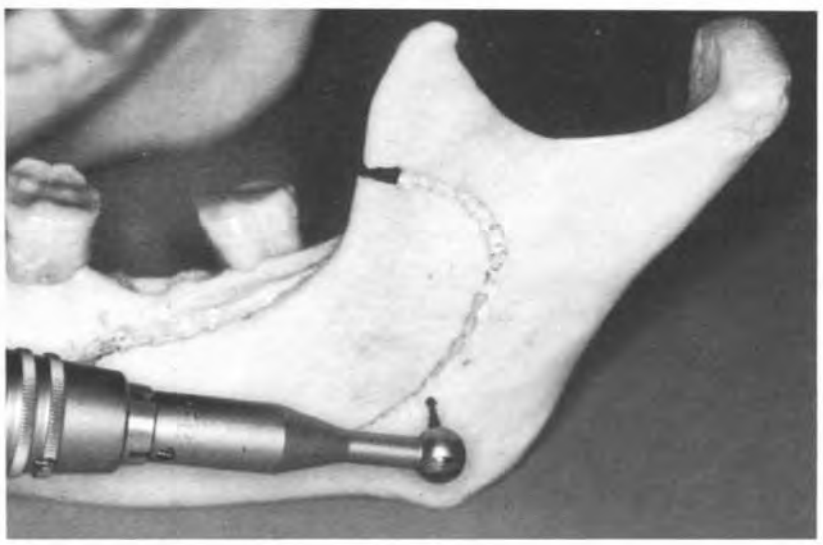

Fig. 7: Lateral view of ramus ascendens using a microburr, bone cuts are made through the lateral coronoid plate.
Fig. 7: Vue latérale de la branche montante utilisant une microforeuse. La découpe de l'os est faite au travers du plateau coronoïde latéral.

Fig. 8: The donor defect of the ramus ascendens.
Fig. 8: Le défect au niveau de la branche montante.

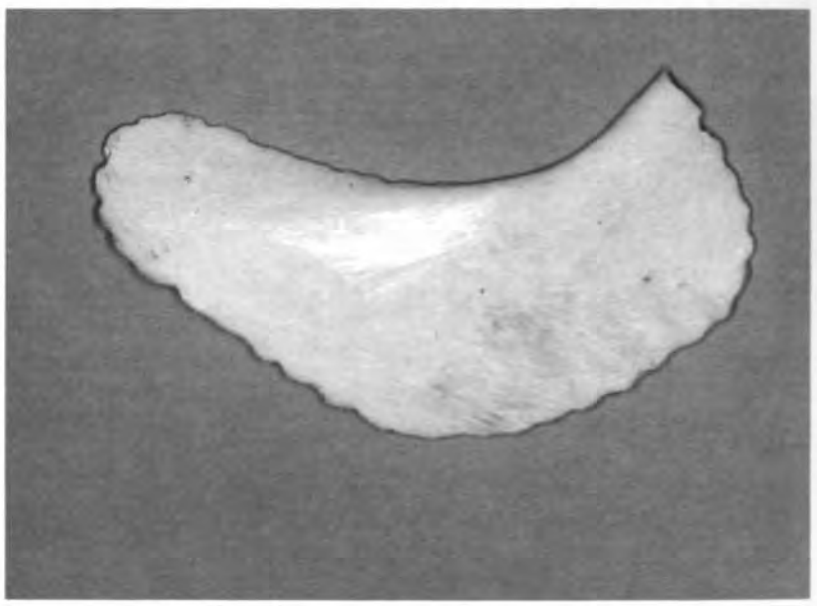

Fig. 9: The graft obtained.
Fig. 9: Le greffon obtenu.

Fig. 10: Examples of reconstruction areas with autogenous bone from the ramus ascendens - orbital floor and paranasal bone.
Fig. 10: Exemple de reconstruction du plancher orbitaire et de l'os paranasal avec de l'os autologue provenant de la branche montante.

Fig. 11: Operative view: the graft is harvested from the left ramus ascendens.
Fig. 11: Vue du champ opératoire: le greffon est recueilli à partir de la branche montante.

Fig. 12: Operative aspect: the donor defect.
Fig. 12: Vue du champ opératoire: le défect au niveau du site donneur.

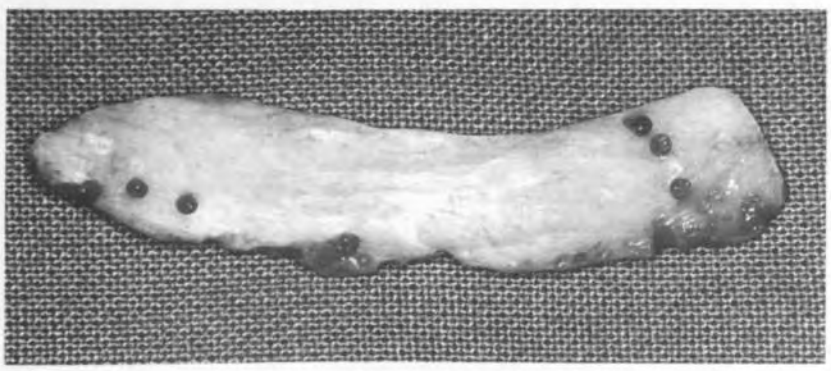

Fig. 13: The graft obtained for reconstruction of the left paranasal bone.
Fig. 13: Le greffon obtenu pour la reconstruction de l'os paranasal gauche.

Fig. 14: Preoperative view.
Fig. 14: Aspect pré-opératoire.

Fig. 15: The location of the autogenous graft for reconstruction the paranasal bone; note the excellent configuration and size of the autogenous graft.
Fig. 15: La mise en place du greffon autologue pour la reconstruction de l'os paranasal. Notez les excellentes configuration et taille du greffon autologue.

Fig. 16: Postoperative view.
Fig. 16: Aspect post-opératoire.

DISCUSSION

The method we use has distinct advantages in comparison to the use of alloplasts or bone from the illiac crest or the calvarian. The main advantage is the use of an easily accessible autogenous bone graft, which can be reached easily by a maxillo-facial and plastic surgeon with a minimum of postsurgical morbidity. Furthermore, the contour and the thickness of the lateral layer of the coronoid process are like the bony structures of the orbital floor and rim as well as the periorbital and paranasal region. The graft has the advantages of both cancellous and cortical components. From the patients point of view the main advantage of harvesting the graft from this region is that it does not lead to any severe structural loss or scaring.

For the reconstruction of orbital defects Bagatin (1985) and Peters (1969) recommended autogenous bone from the mandibular symphysis. The main disadvantage of this method is that the patients complain of lack of muscle lip function in the early postoperative days. Youmans and Russel (1969) took bone from the retromolar area for repairing small discontinuity defects of the mandible. This surgical approach lead Laskin and Edwards (1977) to use a transplant from the retromolar region for immediate reconstruction of the orbital complex. A graft from this region impedes stability with the risk of spontaneous fracturing of the mandible as well as a misfit in shape (convex) and thickness of the cortical layer. Other rarely used regions for harvesting an autogenous bone graft for orbital complex reconstruction are the anterior wall of the maxillary sinus (Kaye 1966, Roncevic and Maligner 1981) and the mastoid bone (Hötte 1970). The main disadvantages of these surgical approaches are the necessity of reconstructing the donor defects.

The comparison of the grafts taken from the mandibular symphysis and the grafts from the coronoid process exposes the main advantage of the coronoid process grafts in the aspects of shape and thickness. Furthermore in some cases, the patients complain of lowered motility and deformity of the soft tissue of the chin when bone graft was harvested from the mandibular symphysis. Therefore we prefer the lateral cortical plate of the coronoid process which is also easier to obtain.

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