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Repair of a perforated sinus membrane with an autogenous periosteal graft: a study in 24 patients

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Abstract

We describe a technique for repairing a perforation of the sinus membrane with a periosteal graft. Of 117 patients who had augmentation of the sinus floor, the sinus membrane perforated in 24, and these were repaired with autogenous periosteal grafts. Patients were followed up daily for the first 10 days and monthly for the next six months, and clinical and radiographic variables were recorded. Patients had to be free of complications such as wound dehiscence, sinus infections, exposure of the graft, local inflammation, or pain. The radiographs showed correct osseointegration of all implants. Periosteal grafts are an effective alternative for repair of a perforation of the sinus membrane.

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Introduction

Augmentation of the sinus floor is a technique used to increase the volume of bone in an atrophic maxilla with autogenous bone or biomaterials, or both, during the insertion of dental implants.¹ It may lead to complications such as bleeding, infection, wound dehiscence, sinus or fistula, chronic sinusitis,^{2–4} or loss of the graft.^{1,5,6} Most of these complications (10%–35%) can be related to perforation of the sinus membrane.^{2,3,6,7} Different techniques have been proposed to avoid perforation of the sinus, such as use of a folding or suturing membrane,⁷ a cyanoacrylate adhesive,⁸ fibrin glue,⁹ plasma rich in growth factors,¹⁰ or collagen membrane,⁹ and conjunctival grafting.^{1,6}

Resorbable collagen membranes have been the most common way to treat a perforated sinus membrane.^{3,7,11} They operate as a mechanical barrier that prevents the invasion of connective and epithelial tissues inside the bony cavity.^{7,9} Although they are widely used, studies have indicated that collagen membranes in these conditions may reduce bone formation and survival of implants,¹² induce the formation of scar tissue, and impair mucociliary activity.¹³ They may also behave differently biologically, depending to their origin and what substances are added to them.¹³

The periosteum is a collagen membrane,¹⁴ which could be used as an autologous graft. It has the additional advantages that it does not cause an immunological reaction and costs nothing. Because of its biological properties it has gained attention as a grafting material for bone repairs, and it shows osteogenic potential.

Periosteal cells have been shown to form bone in vivo in critical defects,¹⁵ as well as to regenerate the condyle and form ectopic bone.¹⁶ It has also been used successfully in orthopaedic procedures,¹⁷ as a pedicle graft for the treat-

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ment of gingival recession,¹⁸ and to regenerate experimental loss of bone.¹⁹ Studies in tissue engineering have found that periosteal cells together with a scaffold-building alloplastic graft have osteogenic potential.^{13,20,21}

A more thorough understanding of the biological potential of this connective tissue will provide the basis for new strategies in the treatment of perforated membranes. The aim of the present study, therefore, was to evaluate periosteum clinically and radiologically as an autogenous graft to repair perforated sinus membrane.

Material and methods

Study group and design

The study was approved by the Ethics Committee of the Federal University, Brazil (Protocol 121-11, retrospective and prospective study), and all participants signed appropriate free and informed consent. From January 2009–August 2014, 117 healthy volunteers (aged 25 to 60 years) had augmentation of the sinus floor. The group was divided into two: 24 patients whose sinus membranes were perforated and treated with periosteal grafts, and 93 patients whose membranes were not perforated. The patients were followed up daily for the first 10 days (until the sutures were removed), and then monitored every two weeks for two months. All patients had dental implants inserted after a healing period of six months, and were monitored for the next four months.

Surgical technique

The augmentation of the sinus floor was done under local anaesthesia, as described by Boyne and James.²² The retro-molar (donor) area was incised, and the mucoperiosteal flap carefully detached to expose the bone, preserving the periosteum. Before removal of the bone graft, the periosteum was detached from the masseter muscle (Fig. 1) with non-stick atraumatic tweezers. In patients who had a perforated sinus, a fragment of the periosteum was removed through a U-shaped incision. The first incision was parallel to the base



Fig. 1. The periosteum was detached from the masseter muscle before the bone graft was removed.

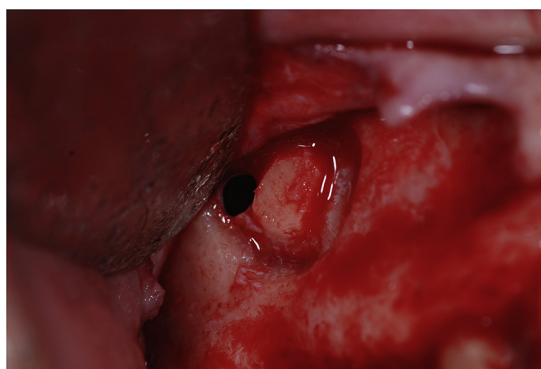


Fig. 2. The first incision was parallel to the base of the mandible in the deepest area of the flap, followed by two vertical incisions, one posterior and one anterior.

of the mandible in the deepest area of the flap, followed by two vertical incisions, one in the most posterior area, and the other in the anterior region. The periosteal graft had to be of sufficient size to cover the perforation in the sinus membrane (Fig. 2). After the periosteum had been removed it was distended on a forefinger (or a glass plate) to dry for about six minutes (Fig. 3A). The dehydrated periosteum was firm enough (Fig. 3B) to allow it to be manipulated and transported to the sinus. When it came into contact with the sinus

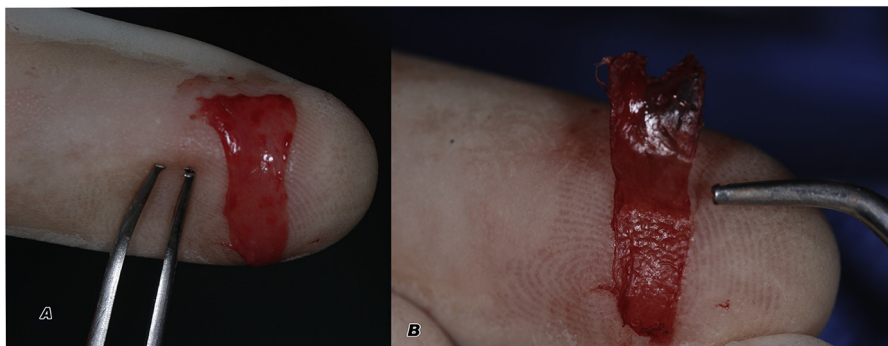


Fig. 3. (A) The periosteum was distended on a forefinger or glass plate to dry for about six minutes. (B) When it was dehydrated it was firm enough to allow manipulation and moved to the sinus.

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