

Predictors of complication for alveolar cleft bone graft

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Abstract

We have analysed the predictors of postoperative complications and the need for reoperation after grafting of the alveolar cleft from one specialised cleft centre. The data were obtained from hospital casenotes of patients operated on from December 2004 to April 2010, with a minimum one-year follow-up from the final operation. Independent variables included postoperative complications and the need for reoperation. Conditional variables were sex, age, type of cleft, sides affected, donor area, type of graft material, and the presence of an erupted tooth in contact with the cleft. A total of 71 patients had bone grafted on to the alveolar cleft. The following associations were found to be significant: postoperative complications and need for reoperation ($p=0.003$); age and complications ($p=0.002$); affected side and complications ($p=0.006$); age and reoperation ($p=0.000$); sex and reoperation ($p=0.001$); and type of cleft and reoperation ($p=0.001$). Proper attention should be given to all the variables and risk factors to overcome the many obstacles that might have an adverse influence on a successful outcome of alveolar bone grafting for patients with clefts.

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Introduction

Orofacial clefts are the most common congenital deformities of the head and neck, and present in about 1/700 live births across the world. They may develop during the second and third weeks of pregnancy as a result of disturbed differentiation of the primordial cell layer and be associated with genetic and environmental factors related to formation of the lip and palate.^{1,2}

Several surgical interventions are required to optimise the restoration of speech, feeding, and masticatory function, and adequate development of the facial skeleton.^{3–5} Alveolar

bone grafting is usually done before the eruption of the permanent maxillary canine or the lateral incisor tooth to provide alveolar continuity, adequate closure of the oronasal fistula, support for the nasal base, and bony support for permanent tooth eruption or eventual prosthetic rehabilitation.^{3,4,6–13}

Several variables may interfere with the outcomes of bone grafting of the alveolar cleft. Details of the patient (such as age, status of tooth eruption on the cleft side, details of the cleft, and the patient's general health), surgical wound conditions (overall oral health, quality and amount of soft and hard tissue adjacent to the cleft, blood supply, donor site, and scar tissue from previous operations) and technical characteristics (graft material, and the surgeon's experience) may all play a part in the outcomes.^{4,14–16}

Whenever a postoperative complication develops the surgical outcome may be compromised and reoperation might be necessary. The need for reoperation increases the

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overall costs of treatment, exposes the patient once more to risks related to the operation and general anaesthesia, and might even be a reason for the patient or family to refuse further treatment. Reoperation will also result in formation of more scar tissue and further compromise the local blood supply and healing of hard and soft tissue.^{5,17}

In this study we investigate the predictors of postoperative complications and the need for reoperation from a specialised cleft centre to provide useful information so that we can anticipate and prevent, or properly deal with and overcome, complications after alveolar bone grafts.

Methods

We retrospectively evaluated the medical records of consecutive patients who had alveolar cleft bone grafts at the Cleft & Craniofacial Centre of the Hospital Geral Universitário (affiliated with the University of Cuiabá – UNIC) to find out the incidence of postoperative complications and the reasons for reoperation related to patients operated on within the period December 2004 and April 2010, with a minimum postoperative follow-up of one year. The study followed the principles of the Declaration of Helsinki, and we had the informed consent of patients or their legal guardians. The study was approved by the Ethics in Research Committee of the University of Cuiabá under the number 068 CEP/UNIC – protocol 2010-066.

Two surgeons (one staff and one resident) were responsible for recording and evaluating the results of the operations. The following variables were recorded: sex; age (12 years or younger, or over 12 years old); type of cleft according to an anatomical classification (clefts of the preincisive foramen or the transincisive foramen); sides affected (unilateral or bilateral); donor area (anterior iliac crest or intraoral); type of corticocancellous bone graft (particulate, block, or mixed); and erupted tooth in contact with the cleft (present or absent). Independent variables were reported for postoperative complication (yes or no), and the need for reoperation (yes or no).

The significances of differences were assessed using Bio-Stat 2009 (AnalySoft 2011, Brazil). Independent variables were tested against conditional variables using McNemar's test (2×2 contingency tables) or the chi square test (3×2 and 4×2 contingency tables), and probabilities of less than 0.05 were accepted as significant.

Results

We studied a total of 71 patients who had alveolar cleft bone grafting procedures (Table 1).

Postoperative complications developed in 29 patients (41%). These included exposure of the graft associated with wound dehiscence ($n = 13$), infection of the wound with purulent discharge ($n = 8$), or resorption of the graft as reported at the orthodontic follow-up ($n = 8$).

Table 1
Descriptive variables ($n = 71$).

Variable	No. (%) of patients
Sex	
Male	32 (45)
Female	39 (55)
Age (years)	
12 or younger	24 (34)
Over 12	47 (66)
Type of cleft	
Preincisive foramen	32 (45)
Transincisive foramen	39 (55)
Sides affected	
Unilateral	58 (82)
Bilateral	13 (18)
Donor area	
Anterior iliac crest	49 (69)
Intraoral	29 (41)
Type of graft	
Particulate	22 (31)
Block	16 (23)
Mixed	28 (39)
Unknown	5 (7)
Erupted tooth cleft	
Present	21 (30)
Absent	43 (60)
Unknown	7 (10)

Correlation between conditional variables and the presence of reported postoperative complications are shown in Table 2. Twenty patients required reoperation (28%). Correlations between conditional variables and the need of reoperation are shown in Table 3. Not all patients who required reoperation had a postoperative complication. Among patients who had a further operation, 17 had a reported postoperative complication, whereas the other 3 required reoperation without any complication reported after the first alveolar bone graft (Table 4).

Discussion

Successful outcomes of grafting of an alveolar bone cleft are defined as long-term preservation of alveolar bone in the area of the cleft; adequate functional support for the nasal structures; eruption, integrity, and periodontal support of the permanent teeth at the site of the cleft; and the ability to place osseointegrated dental implants when required.^{8,13} While previous research has focused on the success rate of the bone graft, we know of few studies that have discussed specific complication rates (reported to be between 15% and 40%), which might significantly influence the need for reoperation.^{3,9,10,12–14,18,19}

Wound dehiscence can lead to infection or exposure of the graft, or both, and may be caused by an excessive amount of bone being grafted into the cleft, tension in the soft tissue after closure of the wound, local trauma postoperatively, or poor compliance with postoperative oral hygiene.^{2,7,11,20,21} Lack of blood supply and nutritional support from the overlying

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