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An audit of success rates of block onlay bone grafts taken from extra-oral iliac crest and intra-oral mandibular donor sites to augment the alveolar ridge, over a 7 year period

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BACKGROUND

Dental implants require sufficient bone in order to achieve good primary stability and predictable soft tissue outcome.(1) Often patients presenting with hypodontia or severe forms of dental trauma, require dental implants to allow fixed replacement of their missing teeth. However, these patients often lack sufficient bone and require alveolar bone grafts to augment prospective implant sites.
The Leeds Teachin Hospital Trust (LTHT) performs grafts harvested from intra-oral mandibular and extra-oral iliac crest sites, depending on the amount of bone required.
These cases are performed in a two stage procedure. The grafts are harvested and secured to the alveolar bone with titanium screws, followed by a second procedure after a period of healing to place the implants.
A retrospective audit was carried out at the LTHT investigating the success and complication rates of Alveolar Block onlay bone Grafts (ABGs). Grafts performed over the last 7 years were included.

AIMS

This audit aims to gather original data of the success and complication rates of ABGs within the LTHT. This will provide valuable data, which is essential when planning or consenting patients for such procedures. The following grafts included in the audit were:

1. Extra-Oral Iliac crest Bone Graft (IBG)
2. Intra-Oral Mandibular chin/ramus Bone Graft (MBG)

STANDARDS

The literature reports varying success rates for ABGs which makes it difficult to know what to expect from these procedures. A review of the evidence including a wide range of studies, demonstrated a success range of 92-100% for onlay bone grafts.(2)

METHODOLOGY

Initially the audit was registered with the LTHT audit governance department, allowing patient records to be viewed.

The patients to be included within the audit were identified from two methods. Firstly, the Leeds Dental Hospital (LDI) log book of patients that underwent a bone graft procedure was used to identify patients under the restorative team. Secondly, to identify the patients that underwent an ABG procedure at the Leeds General Infirmary (LGI), in conjunction with the OMFS department, the coding team was contacted to identify the relevant codes for procedures. The theatre lists were searched using the chosen codes. These lists were compared in order to eliminate any duplicated patients, given that the treatment of these patients is often multidisciplinary involving both teams.
The data was collected retrospectively from patient records that met the inclusion criteria, using a standardised pro-forma.
Data and outcome measures collected:

1. Reason for ABG
2. Site surgery performed and type of anaesthesia
3. Ability to place and restore implants into function
4. Further procedures required at time of graft and implant placement
5. Graft and donor site complications
6. Use of pre/post-prophylactic antibiotics

RESULTS

Distribution of data

- A total of 45 patient records were included in the audit, meeting the criteria outlined above.
- The donor site and type of anaesthetic used are illustrated in Table 1 and 2.1

Graft type	Cases
Mandibular Chin	31
Mandibular Ramus	1
Anterior Iliac Crest	13

Table – Distribution of graft types

Graft Type	Anaesthesia	%
Intra-oral mandibular	LA	62%
	GA	38%
Extra-oral iliac	LA	0%
	GA	100%

Table – Type of anaesthesia used

- Out of the 45 cases, the need for a bone graft was mainly due to trauma (30) and hypodontia (13). 2 cases had ectopic teeth as a cause of insufficient bone.

Success rate

The overall success rate of the ABGs was 93.5%.
The number of successful MBG cases was 29 (total 31); and IBGs was 11 (total 13).
There were 4 identified failures, whereby 3 had necrotic and infected bone at exposure; and 1 case had undergone extensive resorption.

Antibiotic prophylaxis

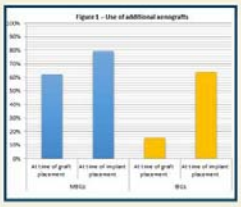
The majority of cases were managed with pre- and post-operative antibiotic prophylaxis.
1 mandibular graft received no pre-operative antibiotic.
All iliac grafts received pre-operative cover.
1 IBG and 1 MBG case received no post-operative prophylaxis.

Additional grafting

The use of additional bone augmentation in conjunction with ABGs was assessed, including those performed at the time of graft and those at the time of the implant placement.(Figure 1).

A greater proportion of MBGs received additional augmentation in both stages over IBGs.
The choice of material for all additional augmentation was Bio-Oss.
Bio-Oss was used more frequently at the implant placement stage than the graft stage.
In all ABGs where Bio-Oss was used at time of graft, Bio-Gide was also used.

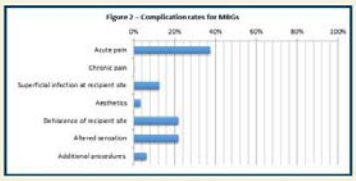
Of the MBGs, 4 of 23 cases used Bio-Oss only at time of implant placement.

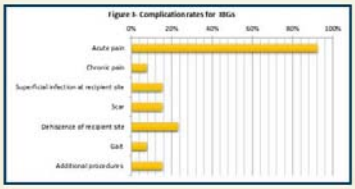


Complications

The complication rates for MBGs and IBGs are shown in Figures 2 and 3 respectively. The average duration of pain experienced by patients was 10.6 and 3.8 days for IBGs and MBGs retrospectivley.

Acute and chronic pain complications
Acute pain was the most common complication.
Chronic pain was rare with only 1 patient that received an IBG, reporting 30 days of discomfort.
No patients reported permanent pain symptoms.





MBG complications

Other common complications for MBGs included superficial infection at recipient site (12.5%) dehiscence of intra-oral wound (21.9%) and altered sensation (21.9%).
One patient had a colour change of a lower incisor post MBG indicating potential devitalisation.
The dehiscence often resulted in exposure of graft and Bio-Gide, but with no detrimental effects.
Most paraesthesia resolved within 2 weeks, 1 patient had permanent numbness of the lower lip.
1 patient experienced a lump within the lower lip soft tissue, thought to be a mucocele.
No patients reported altered profile of the chin.

IBG complications

IBGs were associated with superficial infections (15.4%); dehiscence of recipient site (23.1%) and scarring problems (15.4%).
1 patient reported permanent scaring dissatisfaction.
1 patient experienced gait disturbances for 12 weeks.
There were no reported neurological deficits from the donor site, permanent gait disturbances, haematomas or crest fractures.

Other additional procedures required

The recipient site sometimes required more extensive treatment, with 2 of the IBGs requiring sinus lifts at time of graft placement.
2 of the MBGs required connective tissue grafts to increase the soft tissue widths, to ensure stable soft tissues around the implants and improve aesthetics.

DISCUSSION

Success rate

The success rate identified to be 93.5% was within the standards set by the audit.(2) The reasons for a higher failure rate than some literature may be case selection and that higher risk cases are managed within the hospital setting.(3)

The average dimensions achieved by a ABG are 4mm vertically and 5mm horizontally.(3) If more bone is required to place implants then the treatment may need to be modified or alternative procedures considered. Modifications include the use of a protective titanium mesh in vertical augmentation. Alternative procures include distraction osteogenesis; interpositional grafts and the use of short implants.(4) Despite autogenous bone grafts being considered the "gold standard" in many scenarios, the alternatives must be considered during planning implant cases.

The infection rates may be related to the use of Bio-Oss/Bio-Gide, excessive tension in the wound, antibiotic prophylaxis or medical morbidities of the patient. However, the process of infection is multifactorial and singling out one particular cause is unrealistic. If these factors were recorded at time of surgery in form of a risk assessment, they could provide greater knowledge of the cause of failure.

Antibiotic prophylaxis

The use of prophylactic antibiotics was consistent over the OMFS and restorative departments. However, there was a lack of consistency with the type of antibiotic cover. However, as the departments were prescribing antibiotics in most cases, this complies with guidelines available for such procedures.(5)

There was no link identified with respect to antibiotic prophylaxis and failure of cases. In the event of failure/infection, the cases received both pre and post-antibiotic prophylaxis. A positive change for the department would be to implement a departmental protocol with respect to antibiotic prescribing, which can be reviewed in subsequent audit cycles.

Additional procedures and grafting

MBGs more frequently received additional augmentation at time of graft and implant placement than the IBGs. This may be due to less bone obtained from the more limited sites of the mandible. In addition, this may be related to the difference in the planning of graft placements between the restorative and OMFS departments. The use of Bio-Oss/Bio-Gide was exclusive, which may be due to the relative abundance of evidence compared with alternative or newer materials.(6)

In addition, the use of xenografts was more frequent at the time of implant placement than ABG procedure for both IBGs and MBGs. Additional bone substitute may be required to restore the labial/buccal profile and restore any remaining bony deficiencies around placed implants.

Complications

Acute pain was the most common complication with ABGs, which was of longer duration for IBGs, where more invasive and extensive treatment is required. Another complication was graft site wound dehiscence, which is mainly due to tension within the flap post graft placement.(3) It is not surprising that extensive lack of bone will result in tension in the wound once the bone is replaced. The rate of infection was similar between MBGs and IBGs. One infection was suspected to be related to cystic remnants within the site. Other complications for the IBGs were gait disturbance, scaring and altered sensation. MBGs affected the sensation of the lip and labial mucosa often temporarily, however, some cases reported permanent changes. MBGs were also associated with signs of devitalisation of lower incisors from the donor site.

The literature reports low morbidity with IBGs with similar rates of complications as this audit.(7) However, the use of MBGs offer several advantages including reduced operating times, reduced morbidity, reduced hospitalisation and no cutaneous scaring.(8) There is often no need for a GA to provide MBGs. However, the amount of bone required often determines the donor site that can be used. MBGs at LTHT are consistent with similar complication rates from the literature, with few patients experiencing permanent morbidities and/or failure.(9)

It is important that patients accept these and other complications from the literature, in addition to the need for GA for IBGs and its own associated risks. In addition, it must be considered that even if the ABGs are successful, additional procedures may be needed in order to place ABGs i.e. sinus lifts. In some cases additional procedures may be needed at time of implant placement in order to control the soft tissues and aesthetics.

CONCLUSION

This audit shows that block onlay bone graft procedures are a successful, reliable and safe treatment modality for patients with insufficient bone for implants. The use of ABGs within the LTHT is comparable in terms of success and complication rates within the literature. Appropriate planning and a carefully executed surgical procedure is essential to success. However, these procedures are not without their failures and complications. Given that these are expensive treatments those involved must maximise their success and consider alternatives, where they may offer less risk to the patients. Patients must be aware of such options, together with the information of their relative merits and downfalls.

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