

USE OF HOMOLOGOUS GRAFT IN HIP ARTHROPLASTY REVIEWS WITH ACETABULAR COMPONENT CEMENTATION

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SUMMARY

Hip total arthroplasty represents a breakthrough in the treatment of orthopaedic illnesses affecting the hip. The aseptic loosening of this prosthesis may cause injuries and bone losses, representing a great challenge for the surgical reconstruction of those arthroplasties. One alternative to reconstruction is the use of bone graft sourced by bone bases, which may be used as a block or in pieces. This study, based on a literature review addressing bone grafts,

had as an objective to analyze reconstruction with grafts in blocks and in pieces and its union. The graft in pieces showed better results concerning union when reconstruction stability is achieved. When a good stability cannot be achieved, the graft in block combined with reinforcement rings is highlighted as the best option.

Keywords: Revision; Acetabulum; Transplantation, homologous.

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INTRODUCTION

Bone injuries caused by implants migration constitute cavities with bone structure loss, make prosthesis review difficult, and currently represent a great challenge for hip surgeons.

In this situation, some therapeutic alternatives must be selected, such as the use of large-dimension prosthesis in an attempt to fill that cavity; filling this gap with bone cement; acetabulum implantation with rotation center lift, arthroplastic resection and reconstruction with bone grafts^(1,2).

The reconstruction with bone graft has been shown to be a very attractive method, in addition of being a biological solution, because it is possible to fix an acetabular bone injury, reestablish hip biomechanics and use a normal sized prosthesis^(1,3).

Bone grafts can be divided into: autologous, homologous and heterologous. The incorporation process for a bone graft, whether homologous or autologous, is represented by a sequence of events caused by the graft and by the receptor. That graft's receptor contributes to the formation of blood vessels and cells required for repairing the process. The graft serves as a support structure in which that receptor's response will occur, being this phase named osteoconduction. The matrix of graft and growth factors and residual cells promote an intense cell activity in the receptor, which is necessary for bone formation, being this process named osteoinduction⁽⁴⁾.

The use of bone grafts in review surgeries of hip arthroplasties

with acetabular component cementation has been made with two methods according to the size of bone fragment: the minced form and/or the bone block^(1,2,3,5,6). Regarding the kind of reconstruction, the most used treatment method has been the minced and impacted graft associated to metal mesh (Figures 1A and 1B) or, the bone graft in blocks with or without reinforcement ring (Figures 2 A and 2 B).

The objective of this study was to assess a current trend towards the use of block and minced bone grafts in the medium and long term, in acetabular reviews of hip total prosthesis with acetabular component cementation, based on relevant studies on homologous bone graft use in acetabular reviews of cemented hip total prosthesis.

RESULTS

We found 135 articles published between 1966 and 2002. We used 20 articles we regarded as the most important ones, addressing the use of block and minced graft, and both kinds.

DISCUSSION

Regarding bone union, it seems that it undoubtedly occurs. However, Jasty and Harris, in 1990, reported a high resorption rate in block grafts, evolving to 32% of reconstruction failure in six years of follow-up⁽⁶⁾.

Some authors^(6,7,8) make confusion, and, most of the times, do not distinguish the mechanisms of the expressions bone

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union and bone integration, which, in our point of view, represent quite different situations, where bone integration is essentially important for bone stock restoring and for a longer prosthesis durability⁽⁹⁾.

It was Conn who determined the X-ray criteria for bone integration interpretation during X-ray follow-up. He regards a graft as integrated when radiodensity between the graft and the receptor bone is identical, and when a continuous trabecular matrix is formed on the graft- receptor interface, evidencing a new trabecular pattern, according to the loads applied on that region, then occurring bone reorganization. However, Azuma et al., in 1994, regarded a graft as incorporated when the sclerotic line, which is present on the graft-receptor interface, disappears, with normal density restoring^(10,11).

However, those X-ray criteria for bone integration analysis are difficult to interpret, mostly in the presence of a metal mesh or an acetabular reinforcement ring. Only with a histological study we would be able to state or prove bone integration^(1,5,10).

The vast majority of acetabular reconstructions with bone blocks do not present graft or acetabular component migration process^(6,7,8); this is because, at first, the bone block provides higher stability to the reconstruction when compared to a reconstruction made with small fragments. Acetabular reconstructions with minced graft often evidence acetabular component migration, or a change on acetabular bent angle. This happens because, when we use a minced graft in acetabular reconstructions, it is possible that an acetabular component migration, or a change on acetabular bent occurs, but that component is not loose^(1,5,9,11-14).

The small bone blocks serve as a support for the acetabular component and usually support less than 50% of the acetabular element. Some studies^(15,16) report up to



Figure 1 A - X-ray image of reconstruction with minced graft (preoperative).



Figure 1 B - X-ray image of reconstruction with minced graft (postoperative).



Figure 2 A - X-ray image of reconstruction with block graft (preoperative).



Figure 2 B - X-ray image of reconstruction with block graft (postoperative).

78.4% of acetabular element survival in a follow-up period of nearly 10 years. The large bone blocks used in massive bone injuries with acetabular element cementation and supporting more than 50% of the acetabular component present the worst results in this kind of reconstruction with the use of block grafts. They have a rate of up to 32% of reconstruction failure in a six-year follow-up, therefore, the use of a reinforcement ring is recommended for such cases^(6,17). Acetabular reconstructions with minced graft showed encouraging early results^(1,5,9). A rate of 94% good results is reported in prosthesis reviews with minced and impacted graft in a mean follow-up time of 12 years and, even in patients below 50 years old, they presented a rate of 91% good results. In patients submitted to acetabular reconstruction in primary surgeries for prosthesis, they achieved similar results to those for review surgeries, the use of minced graft, in some autologous case, presented the same characteristics and revascularization and integration ability.

Some studies addressing block grafts in tumor and review surgeries^(18,19) show a slow union, limited only to a few millimeters, leaving the central portion of the block with the presence of necrotic bone. The cortical bone shows an inflammatory response predominantly accompanied by osteoclast activity, causing a temporary enlargement of Haversian channels, resulting in mechanical laxity of the graft.

The histological analysis of biopsies taken in acetabular reconstructions with minced and impacted graft shows that, within a period of eight to nine months after review surgery, there already were signs of revascularization and immature bone formation^(1,5,9,20). Donk et al., in 2002, reported the results of 24 biopsies performed 3 months to 15 years after review surgeries, and, in the first six months, there was a fast graft revascularization and

immature bone formation. Subsequently, this newly-formed bone will undergo a remodeling process into lamellar bone, and, after ten years postoperatively, more than 90% of the graft is integrated^(1,20).

CONCLUSIONS

In cavitory defects, the use of grafts from bone libraries in its minced and impacted form represents the best way to apply

that graft, as well as the best results.

In segmental defects, whenever transforming a segmental defect into a cavitory one with the aid of a reinforcement mesh, and achieving a good reconstruction stability are possible, the minced and impacted graft on acetabulum provides the best results.

When using a minced graft is impossible, the use of a block graft is an alternative.

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