


Fresh frozen allograft in lumbar spine surgery. Does it increase the rate of infection?

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ABSTRACT

Introduction: Unfortunately, the postoperative infection of the lumbar spine is common, multifactorial, and a potentially devastating complication, which is associated with an increase in morbidity and the need for further surgeries and, eventually, it can be lethal. With the aim of decreasing postoperative morbidity, medication and hospital stay, we started using fresh frozen allograft from femoral head from living donors in short lumbar arthrodesis. The aim of this study was to compare infection rates in short lumbar arthrodesis between patients with fresh frozen allograft and patients with autograft.

Materials and Methods: Retrospective study on 153 patients divided into two groups: Group A—84 patients with iliac crest autograft, and Group B—69 patients with fresh frozen allograft, from March 2009 to January 2014, subject to instrumented posterolateral surgery for lumbar spine fusion.

Results: Three of the 153 patients operated on were lost to follow-up (two in Group A and one in Group B), and the sample included 150 patients (82 in Group A and 68 in Group B). There were three infections caused by methicillin-sensitive *Staphylococcus aureus*, all in Group A (4.5%). No patient in either group required blood transfusion.

Conclusions: The use of fresh frozen allograft in posterolateral lumbar spinal surgery due to degenerative causes is associated with no increase in infection rates. We consider FFA to be an excellent alternative because it decreases surgical time and hospital stay.

Key words: Allograft; infection; vancomycin.

Level of evidence: III

ALOINJERTO FRESCO CONGELADO EN CIRUGÍA DE COLUMNA LUMBAR. ¿AUMENTA LA TASA DE INFECCIÓN?

RESUMEN

Introducción: La infección posquirúrgica en la columna lumbar es desafortunadamente común, multifactorial y una complicación potencialmente devastadora, que se asocia a un incremento de la morbilidad y la necesidad de futuras cirugías, y en última instancia, puede ser mortal. Con la intención de disminuir la morbilidad posquirúrgica, la medicación y los días de internación, comenzamos a utilizar aloinjerto fresco congelado de cabeza femoral de donantes vivos, en la artrodesis lumbar corta. El objetivo de este estudio fue comparar el índice de infección en la artrodesis lumbar corta en pacientes con aloinjerto fresco congelado y con autoinjerto.

Materiales y Métodos: Estudio retrospectivo de 153 pacientes divididos en dos grupos: grupo A: 84 pacientes con autoinjerto de cresta ilíaca y grupo B: 69 pacientes con aloinjerto fresco congelado, desde marzo de 2009 hasta enero 2014, sometidos a cirugía instrumentada de fusión espinal lumbar posterolateral.

Conflict of interests: The authors have reported none.

Resultados: Tres de los 153 pacientes operados se perdieron en el seguimiento (2 del grupo A y 1 del grupo B) y la muestra incluyó 150 pacientes (82 del grupo A y 68 del grupo B). Se produjeron tres infecciones por *Staphylococcus aureus* sensible a la meticilina, todas en el grupo A (4,5%). Ningún paciente de los dos grupos necesitó transfusión.

Conclusiones: El uso de aloinjerto fresco congelado en las cirugías de columna lumbar posterolateral de causa degenerativa no se asocia a un aumento en la tasa de infección. Consideramos que el aloinjerto fresco congelado es una excelente alternativa, porque disminuye el tiempo quirúrgico y de hospitalización.

Palabras clave: Aloinjerto; infección; vancomicina.

Nivel de Evidencia: III

Introduction

Unfortunately, the postoperative infection of the lumbar spine is common, multifactorial, and a potentially devastating complication which is associated with an increase in morbidity and the need for further surgeries; eventually, it can be lethal.

With the aim of decreasing postoperative morbidity, medication and hospital stay, we started using fresh frozen allograft (FFA) coming from femoral head from living donors in short lumbar arthrodesis.

To decrease the risk of infection with FFA, it is essential to take extreme care with the techniques of screening, recollection, processing and storage. Moreover, the allograft processing also can favour the increase of infection rates by causing an intense immunologic reaction in the host. The antigenic status brought about by the increase in the number of mononuclear cells in the FFA remodelling procedure has been proved histologically.¹ All this suggests that there is some degree of reject in this allograft, in which blood vessels get occluded, generating rapid necrosis of osteoblasts. However, in turn this immunologic response seems to play a key role in the incorporation of the allograft.

The aim of this study is to compare infection rates in short lumbar arthrodesis between patients with FFA and those with autograft.

Materials and Methods

This is a randomized, retrospective, analytical, observational study of therapeutic value. The series was made up of 153 patients who were divided into two groups: Group A—84 patients with autograft from iliac crest, and Group B—69 patients with FFA, from March 2009 to January 2014, with an average follow-up of 35 months (ranging from 14 to 56) and who were subject to lumbar spinal arthrodesis and dorsal instrumentation, with lumbar disc degenerative disease where we included up to two levels. All the procedures were conducted by the same surgical team. All the patients were operated on by dorsal approach and received antibiotic prophylaxis with i.v. first generation cephalosporin administered during anesthetic induction.

The inclusion criteria were: Patients from 25 to 70 years old, with a <30 BMI, lumbar degenerative disease with up to two levels involved and a minimal follow-up of 24 months.

We excluded patients with previous lumbar spinal surgery, smokers, diabetics and immunocompromised patients.

Patients were randomly allocated to either of the two groups by their ID number (even or odd). Group A, autograft (even ID number), it was made up of 84 patients (54.9%): 45 females and 39 males who averaged 55 years old (ranging from 25 to 68); Group B, FFA (odd ID number), it included 69 patients (45.09%): 40 females and 29 males who averaged 57 years old (ranging from 27 to 69).

The diagnosis of postoperative infection was confirmed in those patients with positive cultures from the wound during surgical wash, which had been sent to Bacteriology and the Histopathology Department at our institution. For the sake of this study we define “acute infection” as the one diagnosed within the first six weeks following surgery.

Surgical technique

Circumferential posterolateral lumbar fusion was invariably conducted by the same surgical team applying the hands-free technique to insert the transpedicular screws. We administered general anesthesia with i.v. induction and maintenance with inhaling agents with special measures of hypotensive anesthesia; right then we administered a first generation cephalosporin vial. The patient was in prone position upon a spinal framework. We carried out asepsis and antisepsis and displayed surgical drapes according to usual technique.

There were no differences in the surgical technique applied to every one of the patients in each group, except autograft recollection in Group A, which was recollected from the dorsal iliac crest, after inserting implants and decompressing through a separate approach, which was later closed by planes using absorbable stitches.

Frozen allograft was removed from storage about one hour before the surgery. It was de-frozen at ambient temperature, milled manually on a table apart and mixed with

powder vancomycin-2 g. The surgical approach was conducted on the middle axis, exposing the dorsal arches and the transverse processes of the levels to be fused. We carried out root release at the affected level by transforaminal osteotomy, and we inserted PEEK (polyetheretherketone) interbody cages with autologous bone (within the cages and also into the interbody spaces) in all the patients, including the FFA patients. Afterwards we carried out decortication at the level of the transverse processes and the laminae with drill and punching reamer trying not to cause fracture in the transverse processes. Bone graft was inserted posterolaterally in dorsal, bilateral way, at the non-decompressed side, once both bars had been satisfactorily placed on the screws.

We carried out haemostasis and inserted drainage before conducting closure by planes of the surgical wound. Drainages were removed between 24 and 48 hours after the surgery if bleeding had not exceeded 50 cm³.

Results

Three of the 153 patients operated on were lost to follow-up (2 in Group A and 1 in Group B); therefore, eventually the sample was made up of 150 patients: 82 in the Group A and 68 in the Group B. We sustained three infections by methicillin-sensitive *Staphylococcus aureus*, all in Group A (4.5%); no patient received blood transfusion. Results showed us non-significant differences ($p=0.315$). The three patients were subject to surgical toilet plus debridement to take samples for Bacteriology and Histopathology. All the patients required hospital stay and i.v. antibiogram-specific antibiotic treatment.

The average surgical time was 148 minutes (ranging from 138 to 158) when we used FFA and 169 minutes (ranging from 159 to 179) with iliac crest autograft. Moreover, we managed to reduce hospital stay in 24 hours and, in Group B, which received FFA, there was no morbidity at the donor site (Table).

Discussion

With fixation systems (posterolateral instrumentation with transpedicular screws), iliac crest autograft has been the reference pattern, but it increases morbidity at the donor site and the surgical time; therefore, it is necessary to look for alternatives such as FFA from living donors.^{2,3} Both types of bone graft have advantages and disadvantages which condition their use. Among the advantages of autograft, we can mention complete histocompatibility with no chance of disease transmission, greater osseointegration, and less time for fusion. Its disadvantages are its limited quantity, considerable complications associated with the recollection of autograft at the donor site, pain (8% to 39%),⁴ problems with the surgical wound, hematoma, neurovascular injury, and pelvic fracture, what increases costs to great extents.

FFA is still an option for fusion in spinal surgery. There are reports on FFA use in cervical and thoracic arthrodesis with good results; however, at the level of the lumbar spine, it may play a limited role in posterolateral fusion.¹ It is associated with several advantages such as sufficient quantity, lack of morbidity at the donor site and the possibility to reduce hospital stay and surgical time; on the other hand, among its disadvantages we can mention the possibility of disease transmission and a slower and lower incorporation as compared with autograft.⁵

In our series, the average surgical time was 148 minutes (ranging from 138 to 158) with FFA and 169 minutes (ranging from 159 to 179) with iliac crest autograft; therefore, it was 21 minutes longer with iliac crest autograft, what increases the risk of infection.

Vancomycin use in FFA might have been a positive factor to reduce the risk of infection as compared with autograft, where it was not used; in our study, there were no infections in the group of patients who received FFA together with vancomycin, and there were three infections in the group of autograft without the use of such antibiotic.

Table. Differences in surgical time and hospital stay between groups

Variable		Group B (Bank)	Group A (Iliac crest)	p
Surgical time (min)	Average	148	169.4	<0.16
	SD	37.8	44.45	
Hospital stay (h)	Average	58.79	73.33	<0.12
	SD	20.19	29.04	

SD= Standard deviation.

Gruenberg et al.,⁶ and Scheverin et al.⁷ found remarkable differences in infection rates between the groups of patients who received vancomycin mixed with the bone graft and the control groups without such antibiotic; in both studies there was a greater number of infections in the latter group. In neither of the two publications they analyze infection rates associated with the use of FFA.

In our study, methicillin-sensitive *Staphylococcus aureus* was the main isolated agent, what coincides with Fang et al.'s and Chahoud et al.'s reports.^{8,9}

On the other hand, Allan et al. report that more than 50% of infections were due to methicillin-resistant *Staphylococcus aureus*.¹⁰

In this study, apart from using vancomycin in FFA, we administered the patients in both groups one dose of i.v. cefazolin 30 minutes before the surgical procedure, what we consider to be important because this is the right antibiotic for the surgical infection spectrum and, according to Dimick et al., it is an efficient method for decreasing the risk of infection for staphylococcus in spinal surgery.¹¹

Mikhael et al.¹² did not find significant differences in the number of infected patients between autograft patients and FFA patients. In our study, the situation was compa-

table—differences were not significant between groups ($p=0.315$).

We believe that one weakness in this work is that we did not use vancomycin in the autograft group, what makes the sample somehow heterogeneous; moreover, we think that, for the sake of statistics, the number of patients required is higher for the difference that we found to be statistically significant.

There are numerous reports on comparisons between different types of bone grafts and autografts which are focused on results in diverse variables: infection rates, medical results, radiologic results, non-union rates, hospital stay costs, number of revisions, etc., with neither criteria unification nor conclusions including all the aspects to the issue.

Conclusions

FFA use in posterolateral lumbar spinal surgery due to degenerative causes is associated with no increase in infection rates. We consider FFA to be an excellent alternative because it decreases surgical time and hospital stay.

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