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**Abstracts of Papers and Symposia**

## DOES THE METHOD OF DISINFECTION INFLUENCE THE SURVIVAL OF ALLOGRAFTS ?

Friecke, Christian; Siemssen, B.  
Endo-Klinik, Hamburg

### Purpose:

The aim of this retrospective study was to investigate if the methods used to preserve donor bone has negative effects on the survival of allografts.

### Material and Methods:

Patients who had undergone bone grafting at the acetabulum during revision hip arthroplasty were divided into two similar groups. Thermoincubation-group: 108 consecutive cases, mean follow-up 58 months, grafts disinfected by thermoincubation, then cryopreserved. Gamma-radiation-group: 128 consecutive cases, mean follow-up 49 months, grafts gamma-radiated and cryopreserved.

Failure was defined as the necessity for a further acetabular revision or as radiological loosening ( $> 4$  mm migration of the cup or circumferential radiolucent lines  $> 2$  mm).

### Results:

Thermoincubation-group: Five cups were exchanged again. Radiographs showed mechanical loosening in a further six cases. The revision rate was therefore 4.6%, the overall failure rate 10.2%. Infectionrate 1.8%.

Gamma-radiation-group: Seven cups were exchanged again. Radiographs showed loosening in eight further cases. The revision rate was therefore 5.5%, the failure rate 11.7%. Infectionrate 1.6%.

The 61 patients from both groups whose large structural grafts were fixed additionally with screws had the significantly ( $p < 0.05$ ) highest failure rate at 18%.

### Conclusion:

1. So far there is no statistically significant evidence that either of the two disinfection methods has a negative effect on the survival of allografts. However, the accumulation of failures in the gamma-radiation-group, requires further observation. It could be an indication that the long term outcome of gamma-radiated grafts might be worse.
2. As a consequence we now use thermoincubated grafts only.
3. Large grafts fixed by screws have significantly worse results.
4. The infectionrate of 1,7% is low.

were analysed mechanically as a prospect of their use for the procedure of impaction bone grafting. This study was an invitro comparative analysis between the fresh frozen and the freeze-dried morselized grafts to investigate for mechanical benefits of the type of grafts to be used for impaction bone grafting.

**Material and methods:** 6 fresh frozen human femoral heads split into two halves. One part used as control (fresh frozen) while the other the test (freeze-dried, irradiated 25kGy) were morselized in the same bone mill to maintain the homogeneity of the samples. Eighteen samples of each type of graft, of equal corresponding weight were subjected to different levels of impaction in containment. Three mechanical parameters analysed were: deformation (change in height), stiffness (Emod) and density on successive impactions. Statistical differences were investigated performing the ANOVA with repeated measures.

**Results:** The freeze-dried grafts deform more than their fresh frozen counterparts causing 30% more bone to be accommodated in a cavity. The freeze-dried bone grafts impacted more easily and faster than fresh frozen (eg.) It takes 150 impactions on the fresh frozen grafts to reach a modulus of 55 Mpa which is attained in 10 impactions on the freeze-dried. They show 50% higher density values ( $p < 0.001$ ) on successive impactions.

**Conclusions (Clinical Relevance):** Freeze-dried morselized grafts have certain added advantages over fresh frozen of being safe and readily available, and are mechanically reliable for the procedure of impaction bone grafting.

#### O 531 THE 'OCTOFIT' ACETABULAR CUP: 12 YEARS' USAGE

Dupuis J.F., Lopez Ejido A., Moreno J., Parra J.  
CMC Parly II, Le Chesnay, FRANCE

The 'Octofit' cup is a cementless impacted acetabular component, covered with HAP and used in a press fit or exact fit way.

Instead of screws, pins are hammered into the bone for added primary fixation. PE or ceramic inserts are available.

This cup has been used for 12 years in 660 patients, among which 9% in case of revision and 56% with B or C Charnley core, without age limit. The stem was cemented in 65%.

At the revision, items taken in consideration are: Harris and PMA score, patient's satisfactory and radiographically: pins motion, PE wear, periacetabular granuloma, radiolucency evolution, cup loosening and revision requirement.

The results are: 96% of the patients are pleased or very pleased. When a radiolucency is present postoperatively, it disappears in 75%.

We did not observe pins migration. Only 1% of the cup required a revision for loosening.

This series, with a long term following encourage us to continue.

#### O 532 DOES THE METHOD OF DISINFECTION INFLUENCE THE SURVIVAL OF ALLOGRAFTS?

Friezecke C., Siemssen B.  
Hamburg, GERMANY

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**Material and methods:** Patients who had undergone bone grafting at the acetabulum during revision hip arthroplasty were divided into two similar groups. Thermoincubation-group: 108 consecutive cases, mean follow-up 58 months, grafts disinfected by thermoincubation, then cryopreserved. Gamma-radiation-group: 128 consecutive cases, mean follow-up 49 months, grafts gamma-irradiated and cryopreserved.

Failure was defined as the necessity for a further acetabular revision or as radiological loosening ( $>4$ mm migration of the cup or circumferential radiolucent lines  $>2$ mm).

**Results:** Thermoincubation-group: Five cups were exchanged again. Radiographs showed mechanical loosening in a further six cases. The revision rate was therefore 4.6%, the overall failure rate 10.2%. Infection rate 1.8%.

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The 61 patients from both groups whose large structural grafts were fixed additionally with screws had the significantly ( $p < 0.05$ ) highest failure rate at 18%.

**Conclusion:** 1. So far there is no statistically significant evidence that either of the two disinfection methods has a negative effect on the survival of allografts. However, the accumulation of failures in the gamma-radiation-group, requires further observation. It could be an indication that the long term outcome of gamma-irradiated grafts might be worse. 2. As a consequence we now use thermoincubated grafts only. 3. Large grafts fixed by screws have significantly worse results. 4. The infection rate of 1.7% is low.

#### O 533 ACETABULAR IMPACTION BONE GRAFTING IN TOTAL HIP REPLACEMENT WITH PARTICULAR REFERENCE TO THE USE OF A PREFORMED MESH

George M.D., Pearce M.F.  
Chelmsford, UK

Impaction bone grafting has become an established technique in restoring major bone stock loss during hip replacement surgery. This study looks at our preliminary results of impaction grafting to restore significant acetabular bone stock loss with special reference to the use of a pre-formed perforated metallic mesh to contain major defects. 45 patients (48 hips) underwent acetabular reconstruction with impaction bone grafting during Total Hip Replacement (6 primary, 42 revision of which 10 had undergone multiple revisions) between 1995 and 1999. 27 of these cases required the use of a mesh to contain the graft in the presence of major defects. The mean age at the time of surgery was 68 (range 35 to 88). At latest follow up (range 6 to 53 months, mean 27 months) there had been no further revisions and few complications (no perioperative deaths or deep infections, 2 dislocations and 1 deep vein thrombosis) clinical hip scores (Merle d'Aubigne and Postel) averaged 5.4 for pain, 5.3 for range of movement and 4.4 for walking ability (Charnley prefix: A 21 patients, B 14 patients, C 13 patients). Radiologically all had complete graft incorporation with no significant cup migration. We consider acetabular impaction bone grafting with use of a supplementary mesh to be a useful adjunct in reconstruction of major bone defects giving reliable restoration of bone stock and encouraging preliminary results.

#### O 534 COMBINED FEMORAL AND ACETABULAR REVISION USING IMPACTED MORSSELIZED ALLOGRAFT

Krarup N., Lind M., Mikkelsen S., Horlyck E.  
Dept. of Orthopaedics Silkeborg Centralhospital  
Silkeborg, DENMARK

**Introduction:** Management of significant bone loss at revision hip arthroplasty is still a matter of controversy. Impaction grafting for restoring of both femoral and acetabular bone stock has been described by Ling and Slooff. We describe results after combined acetabular and femoral impaction grafting.

**Patients and methods:** Between 1992 to 1998, 35 patients had a combined revision with impaction bone grafting. The patients were followed prospectively. Until 1999 all patients were examined clinically and radiographically. The mean follow-up was 3.2 years. 97% completed follow-up. Results were evaluated by incidence of further revision and other complications, patients satisfaction, pre- and post Harris Hip Score. Radiographic evaluation included pre-operative femoral and acetabular bone loss according to the classification systems by Endo-Klinik and Mallory. acetabular bone loss was classified according to AAOS. Post-operatively the incidence of subsidence, bone graft incorporation and signs of loosening were evaluated. Remodeling of the graft was demonstrated in the majority of cases.

**Conclusion:** With a further revision rate of 3%, no sign of subsidence and only one postoperative fracture, our data indicate good results for the use of combined acetabular

and femoral impaction grafting after intermediate follow-up.

**Results:** The mean age was 71.5 years. One patient had a stem revision because of anteversion of the stem causing dislocations. (97% survival). Other four had dislocations, all treated with closed reduction. One patient had a femoral fracture postoperatively and two had infection. The Harris Hip Score increased from 37 to 80 ( $p < 0.001$ ). 86% patients were satisfied with the operation. Radiologically there were no signs of subsidence more than 5 mm and no sign of loosening.

#### O 535 MECHANICAL STUDIES ON A CERAMIC BONE GRAFT SUBSTITUTE FOR USE IN REVISION TOTAL HIP ARTHROPLASTY

Blom A.W., Grimm B., Miles A.W., Cunningham J., Learmonth I. D.  
Dept. of Orthopaedic Surgery Bristol Royal Infirmary  
Bristol, UK

**Introduction:** With the rapid rise in the incidence of revision total hip arthroplasty, the demand for allograft bone is increasing dramatically. In addition allograft has considerable problems with regard to infection, antigenicity, availability, reproducibility and cost. For these reasons alternatives to allograft are being sought.

**Aim:** This study has investigated a porous tricalcium phosphate; hydroxyapatite ceramic for use in impaction grafting of the femur at revision total hip arthroplasty.

We report the findings of an in vitro mechanical study comparing the initial stability of pure allograft, a mixture of 50% allograft and 50% ceramic, and a mixture of 10% allograft and 90% ceramic.

**Method:** Impaction grafting was performed in a specially constructed model, which was then cyclically loaded in a servohydraulic machine to mimic normally loaded gait cycles. Subsidence of the graft/composite was measured.

**Results:** The ceramic/ allograft mixtures exhibited much greater stability and reproducibility than the pure allograft ( $p < 0.01$ ) at the tested loads (200N- 800N). The mean subsidence of pure allograft samples was  $>3.83$ mm over 20 000 cycles of up to 800N, compared with 0.54mm for 50% allograft/ 50% ceramic, and 0.36mm for 10% allograft/ 90% ceramic samples.

**Conclusions:** Mixtures of allograft and ceramic bone graft substitutes have the requisite mechanical stability to be used in impaction grafting of the femur.

The second part of this project is a prospective randomised in-vivo ovine study to assess the extent of osseointegration under load and its effect on mechanical stability.

#### O 536 POLYETHYLENE WEAR, OSTEOLYSIS AND ACETABULAR LOOSENING

Villani C., Conte S., Astorri P., Persiani P.  
Rome, ITALY

We have followed up for a period of six to nine years 100 consecutive hydroxyapatite (HA)-coated total hip replacements. The stem was made of titanium alloy, with the proximal third HA-coated, and the acetabular component a hemispherical HA-coated press fit cup. Patient's mean age was 67 (range 39 to 76 years old).

The Merle d'Aubigne scoring system was used as part of the clinical assessment, (preoperative score was 9.1 and 17.6 at 6 years), antero-posterior and lateral radiographs were taken of the lower pelvis. Revision procedures have been performed only on acetabular components in 4 hips. Three were dysplastic, (male 43 yrs and 4.5 yrs; female 48 yrs and 8 yrs; female 57 yrs and 9 yrs after primary THR), in all causes because excessive polyethylene wear, acetabular osteolysis (major in DeLee and Charnley zone II) and mechanical failure. The other (female 57 yrs, 9 years after primary THR) was affected by rheumatoid arthritis.

In all the revised hips bacterial cultures were negative. 2 more hips are planned for revision surgery of the acetabular component.

Kaplan-Meier rate survival analysis with removal of a component as the endpoint at seven years of follow-up was 100% for the stems and 96% for the cups.