
EXPERT OPINION ON PUBLISHED ARTICLES

Reviewer: Dr Johan Krüger
Suite 4, Rosepark Hospital
Bloemfontein
Tel: (051) 522-8731
e-mail: johan@rosepark.ficmed.co.za

A 6-year follow-up of the effect of graft site on strength, stability, range of motion function and joint degeneration after anterior cruciate ligament reconstruction.

Patellar tendon versus semitendinosus and gracilis tendon graft.

Susan L Keays (PT, PhD), Joanne E Bullock-Saxton (PT, PhD), Anthony C Keays (MD), Peter A Newcombe (PhD), Margaret I Bullock (PT, PhD, AM FTSE)

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Introduction

This is a very interesting study where the authors compared the outcome of the two major types of grafts used in the reconstruction of the anterior cruciate ligament.

The grafts were a bone patellar tendon bone (BPTB) (10 mm) and a quadrupled hamstring graft of the semitendinosus (ST) and gracilis tendons (GR).

The study included 62 patients with a chronic ACL deficiency (31 patients) in each group (BPTB=31 patients and hamstrings=31 patients) with a matched control group of 18 healthy, uninjured subjects.

The purpose of this study was to:

1. Determine any differences in outcome between BPTB and ST, GR reconstructions compared with a control group in terms of strength, joint ROM, stability and function at 6 years after surgery.
2. Determine and compare the degree of progressive joint changes (OA) occurring 6 years after surgery in patients with ACL injuries who had undergone either BPTB or ST, GR reconstructions.

Results

- Clinical stability was restored in all patients.
- The KT-1000 arthrometer side-to-side differences were similar in the BPTB (1.9 mm) and ST, GR (2.0 mm) groups but were significantly greater than that of the uninjured control subjects ($P<0.001$).
- There were no significant strength differences between the surgical and control groups, although a 6% quadriceps deficit existed after the BPTB graft.
- In the more demanding functional tests (hop and triple-hop and carioca) the ST, GR patients performed similarly to the control group, whereas a significant difference ($P<0.05$) existed between the BPTB and control group.
- The incidence of early tibio-femoral OA was significantly greater after reconstruction using BPTB (62%) than after ST, GR (33% $P = 0.002$).

Conclusion

- The 6-year outcomes were very satisfactory irrespective of the source of the graft. However, reconstruction using the hamstring tendons resulted in improved functional performance and a lower incidence of OA.
- The reason for the higher incidence of OA in the BPTB groups may be due to the higher number of meniscal injuries in the BPTB group and the loss of quadriceps strength comparing the reconstructed to the uninjured sides still present at 6 years after surgery in the BPTB group only.

Reviewer: Prof J Walters
 Head: Department of Orthopaedics
 Groote Schuur Hospital
 Cape Town
 Tel: (021) 762-5118

Does bone quality predict loosening of cemented total hip replacement?

M Nixon, G Taylor, P Sheldon, SJ Iqbal, W Harper
JBJS 2007;89B 10:1303-1308

Does the presence of osteoporosis influence implant loosening in THR is the question Nixon *et al* posed in this paper. They retrospectively reviewed 127 patients at 7.7 after TKR by assessing the pre-operative radiographs, radiographs at follow-up, clinical assessment, bone mineral density scan and serology for calcium metabolism.

Patients with aseptic loosening were compared with matched patients with stable implants.

A major weakness of this study is the non-availability of information gathered retrospectively and the non-attendance for follow-up assessment of many recruited subjects.

Of the 127 patients with loosening, 109 (86%) had pre-op pelvic radiographs on which the indicators of bone quality were assessed (Cortex Ratio, Bombelli Biological Classification and Canal Ratio). Only 100 patients (79%) were reviewed clinically, 75 patients (59%) underwent the DEXA scan and 80 patients (63%) had serological tests.

They found that atrophic osteoarthritis was a good predictor for the development of aseptic loosening (80% vs 40%) for hypertrophic OA.

BMD studies showed reduced peri-prosthetic bone density, as well as lower BMD at distant sites (lumbar vertebra, radius) suggesting generalised osteopaenia. Although the authors suggest that the lower BMD seen in patients was not due to disuse osteoporosis but as part of pre-existing disease, this has not been confirmed by this study.

Comment

An important message does emerge from this paper. Patients with atrophic arthritis have a high association with aseptic loosening, and there appears to be an association with generalised abnormal bone metabolism.

Hence their recommendation that such patients should have pre-operative DEXA scans, that patients should be warned of the long term risk of loosening and that routine radiological surveillance is advisable.

The use of bisphosphonates for the treatment of osteoporosis may play a role in reducing aseptic loosening and further investigation into the influence that treatment, and modification of risk factors has on the long-term outcome of hip replacement is recommended.

Predictors of quality of life outcomes after revision total hip replacement

GS Biring, MA Masri, NV Greidanus, CP Duncan, DS Garbuza
JBJS 2007;89B 11:1446-1451

Papers reporting on the quality of life outcomes after orthopaedic procedures often raise interesting associated facts.

In this paper by Biring *et al* they state that the USA estimates that 25% of the total adult population will have arthritis by 2030 as compared to 16% in 2002. The incidence of replacement surgery has increased by 50% for primary and 60% for revision surgery. The increased numbers of patients requiring surgery will inevitably pose a greater burden on Health Care funding. This paper assessed the impact of revision hip replacement on the quality of life on 235 patients at 1-2 yrs postoperative using WOMAC and SF12 questionnaires, and in addition, the UCLA activity score was used for post-op patients. Of the initial 235 patients, 222 (94%) were available for follow-up.

The outcome of the WOMAC and SF12 questionnaires demonstrated that the following factors were statistically significant for predicting improved outcome after surgery:

- Higher pre-operative functional level
- Male
- Age between 60-70 classification
- Lower Charnley classification (i.e. A rather than C)

The UCLA activity predictors for better outcomes were:

- Higher pre-op WOMAC Function scores (not Pain score)
- Aseptic loosening
- The operating surgeon

Comment

While many of these findings are intuitive, these have been validated by this study. It is interesting that the authors did not investigate further the finding that different surgeons in their group had different outcomes, although they did suggest that this could be due to differing postoperative protocols. This finding could equally support the notion that "all are not equal" and individual surgeons outcomes for procedures may in the future be required to support their ongoing participation in any specific activity.

Studies similarly to these can (and will) in the future be used by health care providers and funders to justify their decision to permit or support treatment where greater benefit has been demonstrated.

High incidence of loosening of the femoral component in legacy posterior stabilised-flex total knee replacement

HS Han, S-B Kang, DS Yoon
JBJS 2007;89B 11:1457-1461

Because of the limitation of flexion that accompanies traditional TKR designs, manufacturers have introduced design changes to facilitate increased knee flexion. This paper reports on the outcome in a Korean population where kneeling and squatting in full flexion is a cultural norm. No previous TKR design in their experience had shown a high incidence of femoral loosening.

Twenty-seven (38%) of 72 NexGen legacy PS – Flex femoral components were found to have aseptic loosening. Of these 15 required revision within 23 months of implantation. The authors compared those that were loose with the well fixed knees in this cohort in an attempt to identify causative factors.

The mean pre-op flexion was 134° in the loosened group and 126° in the well fixed group. At follow-up the ranges were 136° and 125° in the two groups respectively.

The percentage of patients whose knees allowed squatting, kneeling and sitting cross-legged was 85% in the loosened group and 49% in the well fixed group.

Loosening was isolated to the femoral component in all cases and there was no associated osteolysis.

The loosened femoral component angulated into a flexed position by a mean of 3°, and all components were removed easily by hand from the cement mantle.

No patients experienced instability in flexion has been reported in the literature.

Concern has been expressed regarding the small gains in maximal flexion from the high flex TKR design changes, because most studies have demonstrated that the post op range of motion achieved is related more to patient factors than implant design or surgical techniques.

Biomechanical studies in the natural knee in deep flexion have demonstrated high peak tibio-femoral stresses of five to seven times body weight.

The authors point out that TKR does not restore the characteristic tibio-femoral contact observed in the natural knee. After TKR the posterior migration of both the medial and lateral contact point stop before reaching the posterior edge of the articular surface.

They state that current design of these components does not allow the femoral component to roll off the polyethylene edge at high degrees of flexion because of the geometry of the posterior lip. They quote a study by Nakayama *et al* that found that this prosthesis had higher peak contact stresses in flexion than other implants they tested.

Comment

The high incidence of short term loosening of the femoral component of the NexGen Legacy PS Flex fixed TKR reported by Han *et al* is alarming. They attribute this to high contact stress in maximal flexion. The paper highlights the importance of implant design conforming to the constraints of nature, of the need to conduct clinical studies of design changes prior to wide public release, and the need for consumer restraint if either of these conditions has not been met.

Reviewer: Prof TLB le Roux
Pretoria East Hospital Suite 8
Morelettapark
Pretoria

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We as orthopaedic surgeons deal with fractures, arthritis and soft tissue injuries and we use many surgical techniques to help our patients.

Do we really understand what we are aiming for with all the treatment modalities? Do we lean heavily on Mother Nature and Father Time to give us good results?

What is really going on at cellular and molecular level and how can we utilise this nanotechnology to get better results in future?

A worthwhile journal to read is *INJURY*, a supplement from vol 38; March 2007. This forms part of the AO Foundation's educational publications.

This is an update on the scientific basis of fracture healing and covers a wide spectrum from mechanics to nanotechnology.

There are good papers on:

- Molecular aspects of fracture healing: Which are the important molecules?
- The role of mesenchymal stem cells in maintenance and repair of bone

There is a wide variety of other papers covering bone healing and bone grafting.

Reviewer: Dr HM Snyckers

Consultant: Department of Orthopaedics
University of Pretoria

PLIF with a titanium cage and excised facet joint bone for degenerative spondylolisthesis – in augmentation with a pedicle screw

Koichiro Okuyama, MD, Tadato Kido, MD, Eiki Unoki, MD, and Mitsuho Chiba, MD
J Spinal Disord Tech 2007;20:53-9

Posterior lumbar interbody fusion (PLIF) was popularised by Cloward in the 1940s as a technique for spinal arthrodesis. Due to a high incidence of complications the initial excitement for the procedure waned.

With the introduction of pedicle screws and anterior interbody devices the initial problem with loss of sagittal correction was addressed. The transforaminal insertion of the devices dramatically decreased the incidence of neurological damage due to traction of the nerve roots.

When compared to the gold standard of spinal fusion techniques, the posterolateral fusion, the technique has proven to give superior sagittal alignment^{1,2,3} and less loss of reduction in spondylolisthesis.⁴ The fusion rate was also superior.

In the eighties the popularity of the procedure began to rise. One of the major factors in morbidity of these procedures was the bone harvesting site. A technique of using the resected posterior elements as graft material was proposed⁵ thus

obviating the need for separate bone harvesting. The concern was that this would lead to a high incidence of non-unions as is the case when this graft source is used for posterolateral fusions. The above article along with a few others that have been published^{5,6} proves that this technique gives excellent union rates with none of the complications of the standard iliac crest harvesting. The patient literature base will increase as this technique is utilised more in the future.

These articles are an important addition to the evidence base for surgeons utilising this technique.

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Reviewer: Prof EB Hoffman

Department of Orthopaedic Surgery
University of Cape Town Medical School
Observatory
South Africa

Recreational all-terrain vehicle injuries among children

An 11-year review of a central Kentucky level 1 pediatric trauma center database

B Kute, JA Nyland, CS Roberts and V Hartwick-Barnes
Journal of Pediatric Orthopedics 2007;27:851-5

Local database review

A retrospective comparative study of 238 admissions for recreational all-terrain vehicle (ATV) accident-related injuries over an 11-year period (1995 to 2005) at a level 1 paediatric centre in Kentucky was performed.

The mean age of the children was 11.4 years (60% between 11 and 15 years) and 70% were boys. Rollover was the commonest (37%) mechanism described and 84% were not wearing a helmet. ICU admission was required for 18% of patients and one child died during hospital admission (death at the scene of the accident was not included in this study). Of the 238 children, 150 (63%) sustained at least one fracture. Of the 204 fractures, 25% were of the skull and face, 15% femur, 14% tibia, 10% forearm, 8% pelvis, 6% humerus and 4% spine.

Comparative United States data

All-terrain vehicles (ATV) were introduced in the United States in the 1970s. Since 1982 there have been 6 494 deaths (± 260 per year) following ATV accidents; one-third of these deaths

were younger than 16 years. In 2004 there were 136 000 ATV accident-related injuries of which one-third occurred in children younger than 16 years.

Between 1988 and 1998 there was a safety agreement between the Consumer Product Safety Commission and the ATV industry known as the Consent Decrees, which restricted operators younger than 16 years and halted the sale of three-wheeled vehicles.

Since this agreement expired in 1998 there has been a five-times increase in ATV accident-related injuries in the authors' study. They concluded that children younger than 16 years should not be allowed to operate an ATV, and drivers older than 16 years must pass a written and practical examination. Helmet use should be mandatory and passengers should not be allowed.

South African perspective

All-terrain vehicles are better known in South Africa as quad bikes. Significant injuries (even death) in children are increasingly seen at private hospital trauma units. An attempt to initiate a lobby to restrict the use of these vehicles in children is hampered by the absence of an interhospital database between private hospitals (even in the same group). Furthermore, ICD-coding for four-wheeled motorcycles does not exist.