2015 ICRS Convention Abstract

19.3.3 - Focal Knee Resurfacings – Filling the void between biological resurfacing and arthroplasty. (ID 7168)

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Introduction

The treatments for osteochondral defects (OCDs) are varied, largely falling into the categories of cartilage regenerative procedures (CRPs) or arthroplasty. Both of these methods have strengths and weaknesses. Here we discuss a modern technique to deal with these - focal knee resurfacing implants. Cartilaginous lesions are found in up to 61% of knee arthroscopies, and due to the properties of articular cartilage, they have limited capacity for self-repair and can lead to propagation and further deterioration. Symptomatic improvement and preservation of the native joint are the goals of treatment in these patients. These lesions have traditionally been treated with cartilage regenerative procedures or arthroplasty.

Cartilage Regenerative Procedures: A UK national consensus paper is currently being published regarding these. Microfracture is often used as a first line treatment of lesions less than 2cm2 (1), this technique is relatively straightforward and cost-effective but the cartilage it produces is mechanically inferior to native hyaline cartilage and its lifespan variable, estimated to be between 2-5 years in high-demand patients(2). Autologous chondrocyte implantation (ACI) is used to treat medium to large full thickness defects. It involves 2 stages, is expensive and labour intensive for both surgeon and patient but it has shown good long term results with 10 year survivorship of 71% and 75% of patients reporting improved function(3). It has also been shown that ACI following prior marrow-stimulating treatment has a much higher failure rate (26% failure vs 8% in those who have and have not had prior treatment, respectively.)(4) There are a number of different cartilage regenerative techniques, all of which have good results, they all, however, require intensive rehabilitation, a period of protected weight-bearing, often 2 procedures and these limitations make them unsuitable or undesirable for many patients.

Focal Knee Resurfacings: Due to the limitations of CRPs and the poor survivorship and satisfaction rates amongst young patients with knee arthroplasties, focal knee resurfacings have been developed with a view to 'fill the void' between these two treatment modalities. They are all performed as a single stage minimally-invasive approach and allow immediate weight bearing on the operated limb.

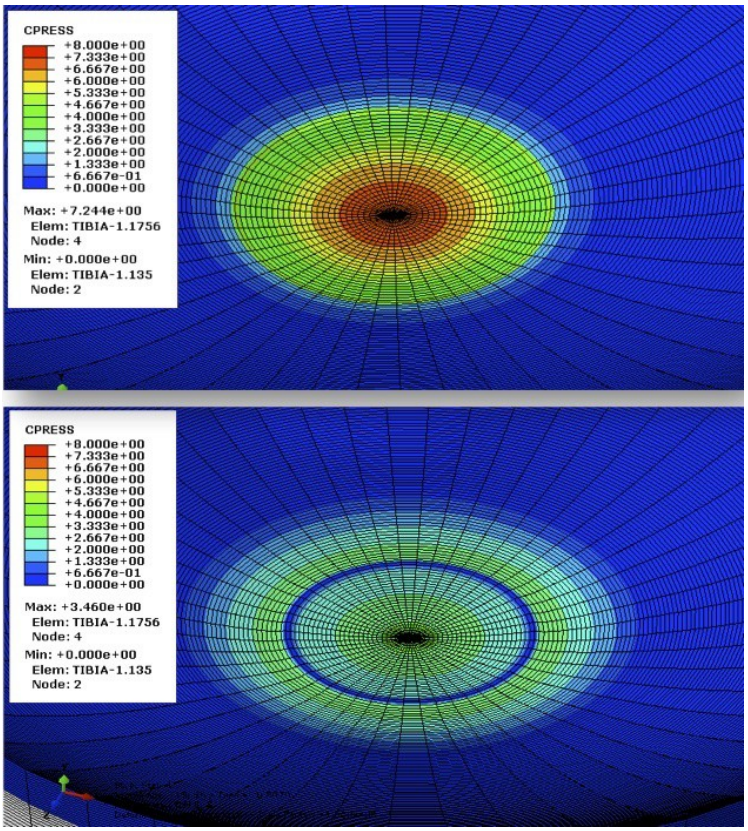
Content

There are a few such implants on the market. In our unit, we use the BioPoly RS Knee system as part

of a national multi-centered trial. It is an uncemented devise, the articular surface is a microcomposite of UHMWPE and hyaluronic acid, creating a hydrophilic articulating surface with a material that has a more similar modulus of elasticity to the native cartilage than the traditional metal bearing surface. Currently, this devise is only available in the EU. The inclusion/exclusion criteria for our study allow for inclusion of patients 21 years and older with focal chondral or osteochondral lesions that are within the size limitations of the implants, up to 3.1 cm2 .The main exclusion criteria for the study include kissing lesions in the opposing tibial cartilage along with BMI >30.

Biopoly implants size options and intraoperative view.

One of the earlier devices is the HemiCAP. This consists of a cannulated cancellous screw with a tapered distal tip made of titanium alloy. This connects to an articular dome via a Morse taper, the dome is available in two diameters, 15 & 20mm. The articulating surface is a cobalt-chromium-molybdenum alloy with plasma spray coverage on the undersurface for bony on-growth. The Episealer is a patient specific joint resurfacing implant devise that has recently become available for usage, it uses PSI technology to obtain an anatomical fit but there is, currently, no human data on its performance.



Pressure mapping looking at metal implant on tibial cartilage contact pressures, peak 7.24MPa, active contact zone loaded area - 314mm^2 and BioPoly implant on tibial cartilage contact pressures, peak 3.46MPa, active contact zone loaded area - 471mm^2.

These pressure mappings demonstrate that the BioPoly produces 52% lower contact pressure on the tibial surface and the contact load zone is 50% greater than compared to a metal implant. This has the effect of reducing compressive strains on the tibia by 66%.

Clinical Results of Focal Knee Implants

In 2011 Becher et al(5) produced their 5 year follow up results of using the HemiCAP for medial femoral condyle defects. Their patients' mean age was 54 and there were 21 patients. They found an overall improvement in the KOOS score, as compared with their pre-operative scores, in all domains (pain 51.1 to 77.6; symptoms 57.9 to 79.5; ADLs 58.8 to 82.4; sports 26.3 to 57.8 and QOL 34.4 to 55.0.) Their SF-36 physical health score improved from an average of 15.2 to 46.9, although the mental health component remained unchanged. 16 out of 21 patients were satisfied with the procedure.

In 2012, Bollars et al (6)found similar results, reporting that 83% of patients had normal or nearly normal post operative scores at an average follow up time of 34 months. They also found that patients who did not meet their inclusion criteria fared poorly with 7 out of 8 patients who had the procedure but did not meet these required conversion to a total knee replacement. The exclusion

criteria were: age >65, BMI > 35Kg/m2, coronal plane malalignment > 7 degrees varus / valgus, inflammatory arthropathy, chronic instability, > grade II changes in opposing tibia, significant symptomatic damage to articular surface in other compartments, lesion greater diameter > 20mm.

The 2013 Australian joint registry(7) reported their 5 year revision rate for partial knee resurfacings (all HemiCAPs) was 26.4%, they represented 0.4% of the Australian knee arthroplasty market. 86.4% of implants were performed for osteoarthritis, 74.4% of patients were under 55 years of age and there was a male majority at 54%. Of the 176 implants, 125 (71%) were femoral, 10 patella, 6 tibial, 7 trochlea and 2 unknown. The most common reasons for revisions were disease progression (58.7%,) loosening (15.2%) and pain (6.5%). Most primary partial resurfacings are revised to either total knee replacement (54.3%) or unicompartmental (26.1%). The remainder include revision to a patella/trochlear (8.7%), addition of another resurfacing component (8.7%) or removal of the prosthesis (2.2%).

The 2 year results from the BioPoly RS Knee Registry Study (26 implanted at time of writing) show an average patient age of 45 and an average lesion size of 2.2cm2. 14 patients have 6 month follow up, 3 have 2 year follow up. The data thus far shows global improvement in KOOS and VAS assessments. At 6 months, 1 year & 2 years post operatively (compared to pre-operative scores,) the KOOS shows the following improvements - Symptoms: from 48 to 73, 75 & 90 (6/12, 1 year & 2 years). Pain 47 to 79, 76 & 97. ADLs 58 to 89, 90 & 100. Sports 23 to 55, 53 & 95. QOL 25 to 50, 47 & 94. VAS improved from 3.3 to 0.6, 1.8 & 0. There have been no revisions so far of BioPoly implants.

Regarding focal knee resurfacing implants, the literature is limited by small case numbers, brevity of follow up, most data relates to a first generation implant and we do not yet fully know who is our ideal patient. All of these limitations are a result of a nascent technology, we await with interest longer term studies using the ‘next generation’ implants.

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