The information contained in this document is intended for healthcare professionals only.

stryker

Orthopaedics

Avon™ Patello-Femoral Arthroplasty
Surgical Protocol

The Avon™ Patello-Femoral Arthroplasty

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Table of Contents

Introduction

Isolated patello-femoral arthritis occurs in up to 10% of patients with arthritic symptoms in the knee joint[1,2,3]. Conservative treatment is reasonably effective in improving the symptoms, but eventually when the articular cartilage has completely eroded, the symptoms may become intrusive. Typically, there is swelling and giving way of the joint, difficulties with steps and stairs. Finally, negotiating hills increases the severity of the symptoms.

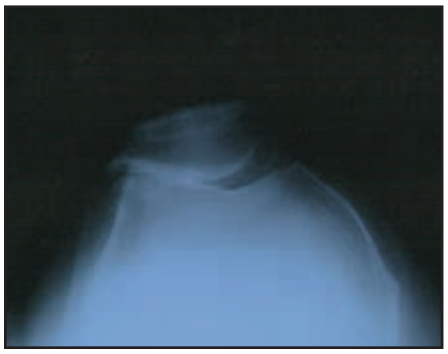
In the past patellectomy has been a common treatment which leaves the knee joint significantly weakened, and the clinical results are excellent in less than 50% of cases[4].

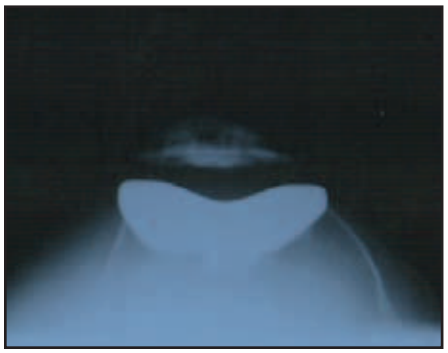
Development of the total knee replacement has shown that the patello-femoral joint can be successfully replaced. Modern joint replacements, where the biomechanics of the patello-femoral joint have been taken into consideration, are now giving excellent results[5,6].

Isolated patello-femoral arthroplasties have been available for some years, but little attention has been paid to the congruity of the patello-femoral joint and the tracking of the patella. Reasonable results can be obtained from the earlier designs, but they tend to deteriorate with time and do not approach those of the total joint replacement[7,8,9,10,11,12,13,14,15,16].

The Avon™ Patello-Femoral Joint Arthoplasty is designed to reproduce accurately the congruity of the natural patello-femoral joint throughout its range of movement and to facilitate central tracking of the patella in the trochlear groove.

- The trochlear surface is broad proximally to allow free movement of the patella in extension.
- The femoral component can be translated laterally and placed in 3-6º of external rotation to reduce lateral overload.
- The trochlear funnels to capture the patella as flexion occurs, facilitating central tracking.
- Contact of the patella with the trochlear is maintained up to 100º [5,6,17,18,19].





Post-Operative Instructions

Post-operative rehabilitation is similar to cases undergoing total knee replacement. Surgeons will notice that rehabilitation is considerably faster than with a total knee replacement. Suction drains should be removed at 24 hours. Ice and anti-inflammatory analgesics should be used regularly to reduce pain and swelling for at least two to three weeks. If flexion is slow to develop within two to three days, then continuous passive motion can be helpful.

The patients are generally able to get up and walk on the first post-operative day and start an active range of knee movement. Ninety degrees of knee movement is generally achieved within 4-6 days and the patients can be discharged within this period.

Occasionally patients are slow to mobilize[7], in which case more intensive rehabilitation is required. If there is a significant hemarthrosis, then an early arthroscopic wash out is advised. If more than 90 degrees of movement has not been obtained within four weeks, then admission for manipulation and intensive rehabilitation is essential.

Indications

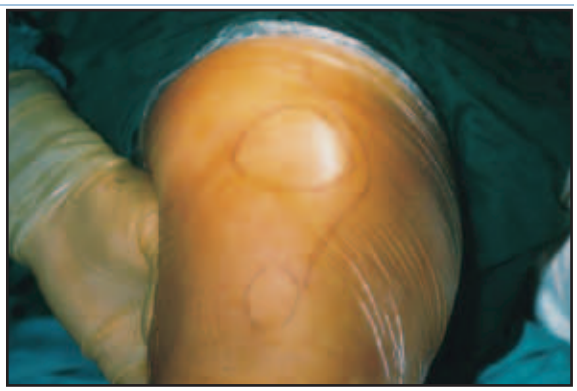
Patients who have isolated patello-femoral arthritis with intrusive symptoms which have not been controlled by conservative management can obtain good results from this procedure. Radiological screening with a weight bearing antero-posterior and weight bearing lateral view with a tangential patello-femoral view at 30º of flexion can identify patients eligible for the procedure.

The arthritic disease should be confined to the patello-femoral joint with a substantially normal tibio-femoral joint. The final decision however has to be made at the time of arthrotomy. Small areas of local chondral damage on the medial or lateral femoral condyles of the tibio-femoral joint are acceptable and may be treated by a local chondrectomy. It is essential that the menisci and cruciates are intact and that there is a good range of movement in the joint. Like all arthroplasties, success depends on careful selection of appropriate cases, a technically competent procedure and carefully controlled rehabilitation.

Surgical Technique

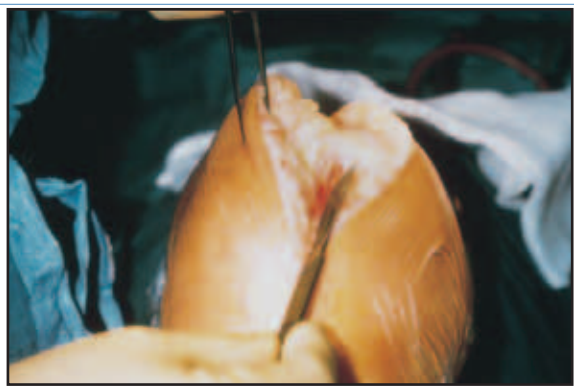
1

The patient is prepared for total knee replacement surgery. A leg holder allows support of the leg for easy adjustment. A tourniquet is generally used. A medial parapatellar incision is preferred.



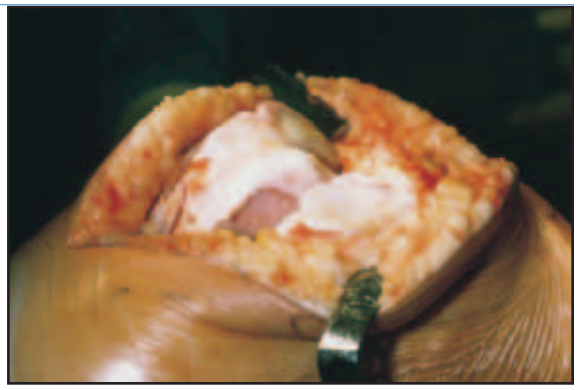
2

The incision is made with the knee flexed to 90 degrees. It should be extended to the tibial tubercle and the capsule incised on the medial side. Care should be taken not to damage the medial meniscus during division of the synovium. The lateral flap should be released to enable the fat pad and the patella to be everted. Be careful to avoid damage to the anterior meniscal and cruciate structures.



3

The patella is everted laterally to expose the anterior aspect of the knee joint. The synovium around the edge of the patella is incised to define the edges. Release of the lateral retinaculum from the lateral margin of the patella and osteophyte is always required. (A peri-patella release).



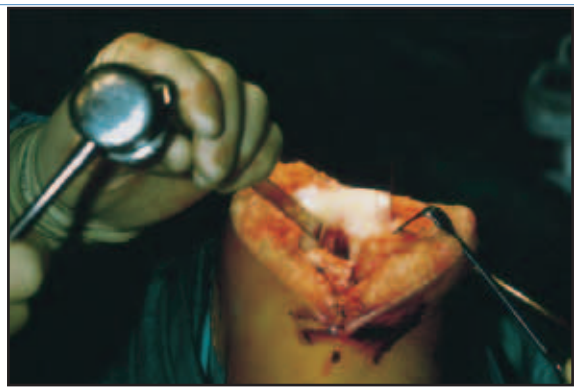
4

A notchplasty may be required to remove notch osteophytes, confirming the integrity of the cruciate ligaments.

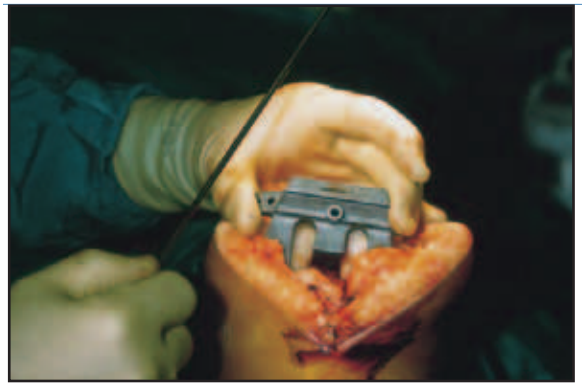
The index finger is inserted into the notch to ensure a smooth arch and adequate space for the cruciate ligaments.

The anterior aspect of the femur should be exposed by incision of the anterior synovium of the supra patella pouch.

The flaps are elevated to get a good view of the anterior cortex of the femur.

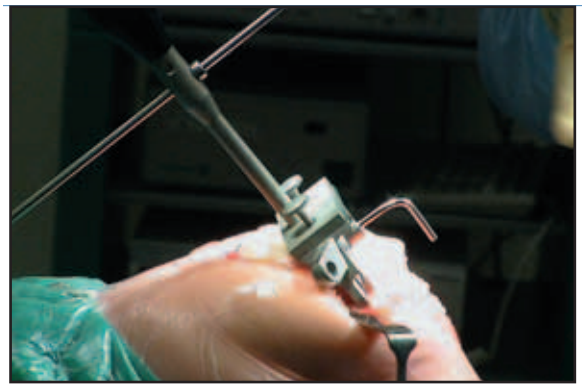


Surgical Technique



5

Place the anterior cutting guide onto the femoral condyles so that the flat surface is parallel to the anterior cortex of the femur. This is facilitated by the saddle of the guide which is placed in the notch of the femur. The two inferior skids provide a reference for placement against the posterior aspect of the condyles, although this cannot be easily seen with the limited incision that is generally used.



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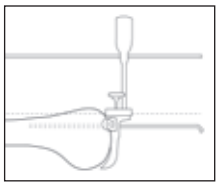
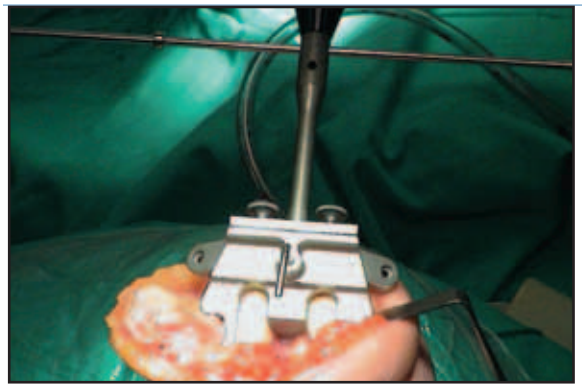
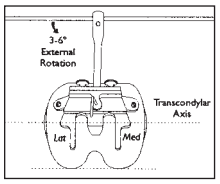


The extra medullary femoral alignment guide rod and tower are designed to assist in obtaining accurate alignment. This should be in line with the anterior cortex of the femur in the lateral sagittal plane. A 1⁄8" diameter hole is drilled into the intramedullary canal through the central drill guide of the cutting block and the intramedullary rod inserted.

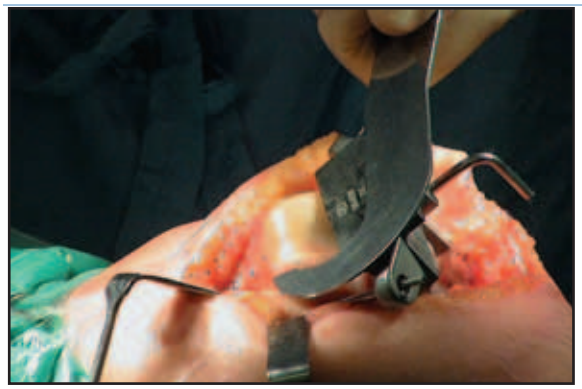


7



Final positioning of the femoral cutting block is confirmed with respect to rotation.

Attention should be made to ensuring that there is 3-6º of external rotation of the block on the femur. Internal rotation may lead to mal- tracking and overload and should be avoided. When satisfactory alignment has been achieved the position of the block is fixed with two 1⁄8" diameter pins. The lateral pin should be inserted first to minimize internal rotation of the block. The extra medullary tower is now unscrewed.



8

The height of the trochlea is assessed using the anterior reference indicator which measures the exit point of the anterior resection using the superior surface of the cutting block. The cut should pass just beneath the deepest part of the groove, exiting parallel to the anterior cortex.

6430-1-001
Avon Anterior Cutting Guide

6430-1-450
Extra Medullary Femoral Alignment Guide

6430-1-400
Femoral Alignment Rod Tower

5800-4-125
1/8" Diameter Drill

6430-1-010
Avon Guide Rod

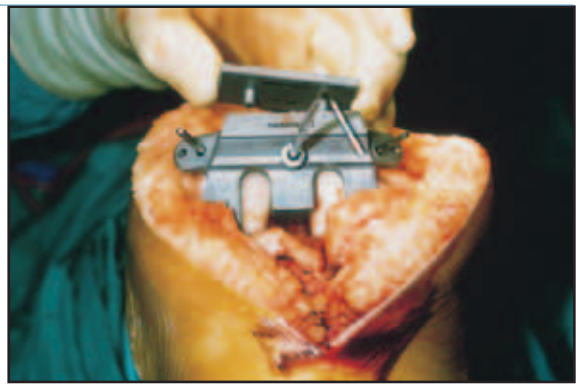
6784-8-145
1/8" Diameter Pins

6633-8-052
Anterior Reference Indicator

Surgical Technique

If the zero position of the cutting guide produces a resection which removes too much bone, then the 2mm, 4mm or 6mm plates may be added to raise the level of the cut so that notching of the anterior femoral cortex does not occur. If in doubt, always use a thicker cutting plate to remove the minimum amount of bone; more can be removed later if required.

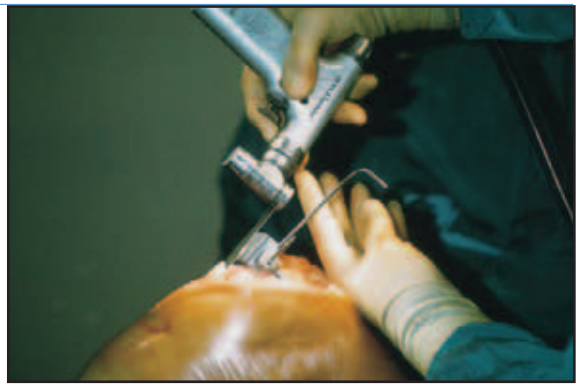
9



Once a satisfactory resection of the anterior trochlea has been achieved, place the Trial Template onto the cut bone surface. Sizing is correct when a gap of 2mm is present between the template and the anterior part of the intercondylar notch. This will allow a thin bridge of intact articular cartilage between the intercondylar notch and the posterior edge of the prosthesis.

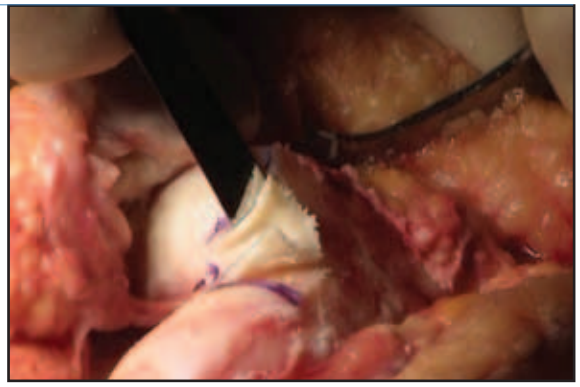
10

The articular cartilage at the edge of the template is marked with a pen.



The articular cartilage underlying the area of the template is removed so that the prosthesis can be inset close to the articular edge. This can be lifted off the sub-condylar bone using an osteotome held in both hands and moved vertically across the surface. The osteotome is used to complete the removal at the tip of the prosthesis.

11



Anterior Cutting Guide

6430-1-002 2mm
6430-1-003 4mm
6430-1-008 6mm

Avon Femoral Drill Templates

6430-1-050 Extra Small
6430-1-100 Small
6430-1-200 Medium
6430-1-300 Large

Avon Femoral Trials

6430-1-051 Extra Small
6430-1-101 Small
6430-1-201 Medium
6430-1-301 Large

6784-8-145

1/8" Diameter Pin

6430-1-009

Avon 4.5 Drill

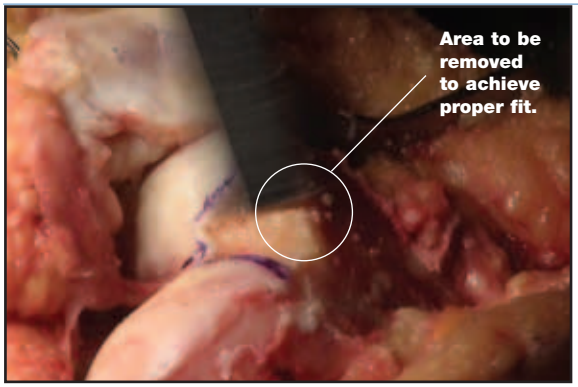
6633-7-605

Pin Puller

6430-1-006

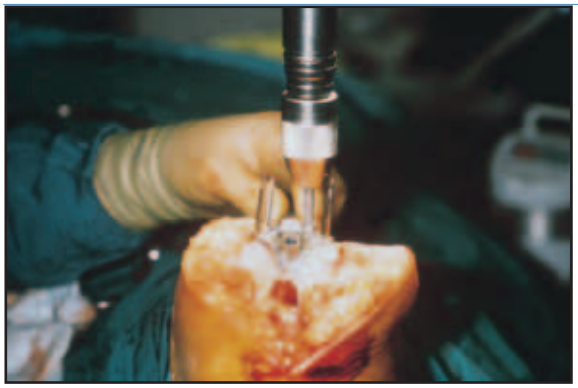
Femoral Impactor

Surgical Technique



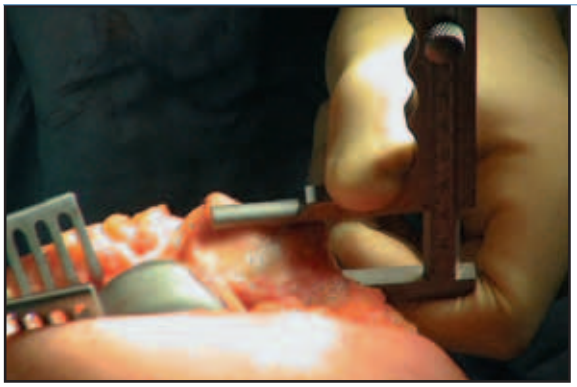
12

The bone is then shaped to provide a smooth transition between the anterior surface of the femur and the curved part of the condyles. This is easily done with the edge of the oscillating saw, osteotome or a bur. The fit is checked with the template. Once a perfect fit has been achieved the femoral template is punched into position and secured using four pins.



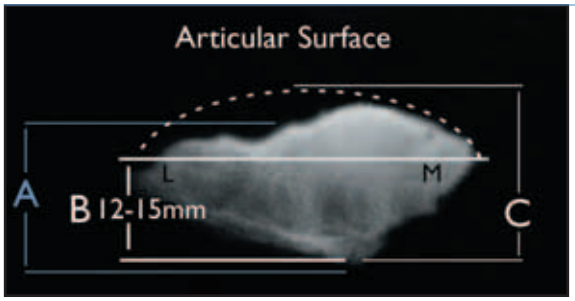
13

The four guide holes in the template are drilled with the 4.5mm drill to accommodate the fixation studs of the implant. The template is then removed and the trial prosthesis impacted into position to provide a correct fit. The inferior stud is inserted first. The prosthesis is punched into position in the line of the long axis of the femur. The position of the impactor is then increased to 30°, then to 70° and finally to 90° with the second flat surface of the punch.



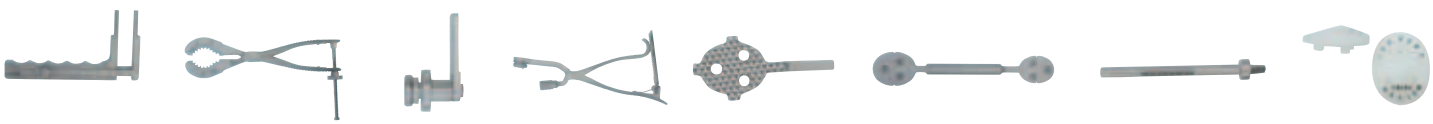
The Patella. **14a**

The soft tissue attachments at the periphery of the patella are incised to expose the insertions of the quadriceps and patella tendons. The lateral patello-femoral ligament is incised and released close to the femur **avoiding the geniculate arteries**. An important release of the lateral retinaculum is performed on the lateral margin of the patella from the proximal quadriceps tendon down to the distal patella tendon. Sufficient release should be performed so that the patella moves freely both medially and laterally. (A sub periosteal Peri-patella release).



14b

The height of the patella is measured with the calipers. *(Measurement A, Step 14b)*. Allowance is made for the patella wear. The patella cutting guide is positioned so that after allowing for the worn bone and cartilage, between 6mm and 11mm of the patella is removed. This is equivalent to the thickness of the prosthesis and when the prosthesis is implanted should correct restoration of patellar height. A minimum of 12mm of patella bone should always be left after the resection.



6633-7-855 Patella Caliper

6633-7-736 Patella Resection Guide

6633-7-738 Patella Stylus

6633-7-744 Patella Clamp

6776-8-945 Patella Template Attachment

Patella Drilling Templates
6776-8-901 Small/Large
6776-8-903 Medium

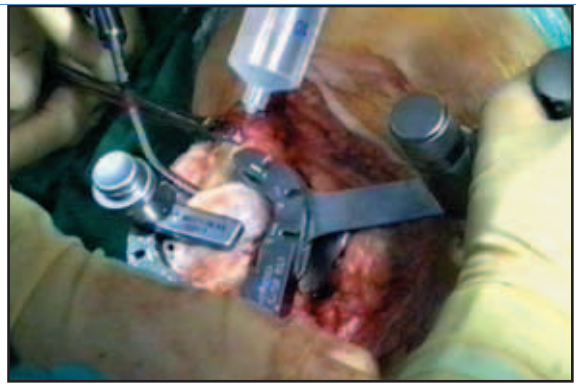
6776-8-909 Patella Drill

Avon Patella Trials
6430-1-020 Small
6430-1-030 Medium
6430-1-040 Large

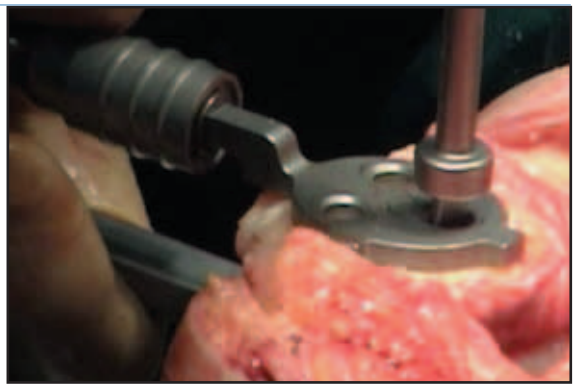
Surgical Technique

15a

An oscillating saw is used to make the cut and the residual bone thickness checked with the calipers *(Measurement B, Step 14b)*. Apply and centralize the Patella Drill Template and drill the three peg holes. The appropriate patella trial is inserted (small, medium, large) and the restored height is checked *(Measurement C, Step 14b)*. **The thickness of the patella prostheses are: Small 9mm, Medium 9.5mm and Large 10mm.**



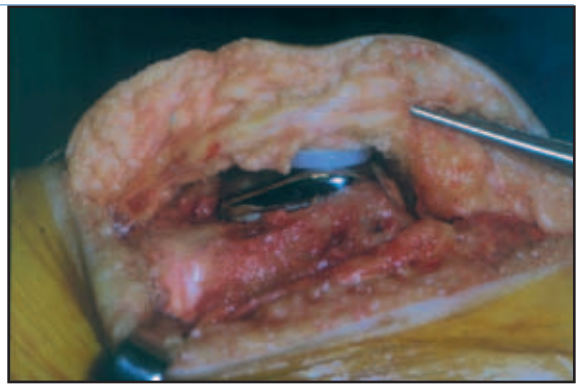
15b



16

The patella is reduced and the tracking checked to assess stability of the patella in the femoral groove while the knee is flexed through 120 degrees. The medial facet of the patella should be in contact with the femur throughout the range of movement. The 'rule of no thumb' is applied by ensuring that tracking is stable without pressure from the thumb. If tracking is not perfect, further release of the retinaculum from the edge of the patella should be performed. The stitch test helps to judge the patella tracking.

If there is persistent mal-alignment of the patella, then it may be necessary to consider bony or soft tissue realignment using the Roux or Elmslie techniques. If this is felt to be inadvisable, then the surgeon should proceed to a total joint replacement which will allow correction of tibial rotation.

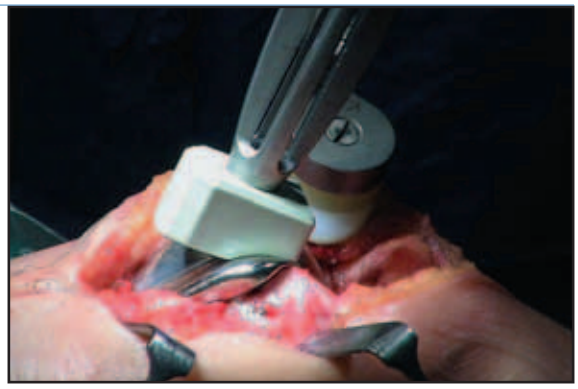


17

Once satisfactory tracking has been confirmed, bone cement is applied to the cut anterior femoral surface and the patella, using a cement gun (with an oblique cut to the nozzle) to pressurize the cement.

The Femoral Impactor and Patella Clamp are used to seat the femoral and patellar prostheses. A final check of satisfactory patella tracking is made and the wound is closed in the usual way.

Ensure there is no edge impingement of the medial border of the patella on the femoral condyle at 120° flexion. The flat odd facet of the button should present a smooth surface at this point.



6430-1-006
Femoral Impactor

6633-7-744
Patella Clamp

Femoral Prostheses

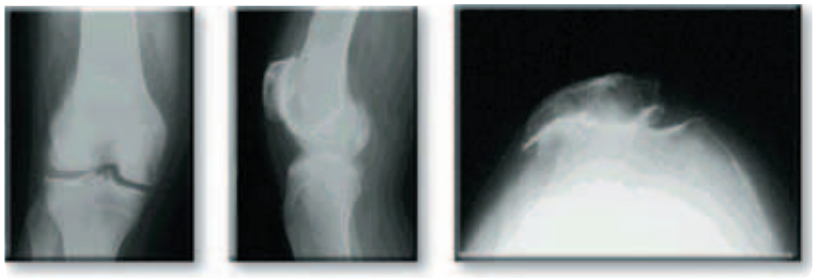
6430-0-050 Extra Small
6430-0-100 Small
6430-0-200 Medium
6430-0-300 Large

Patella Prostheses

6430-0-020 Small
6430-0-030 Medium
6430-0-040 Large

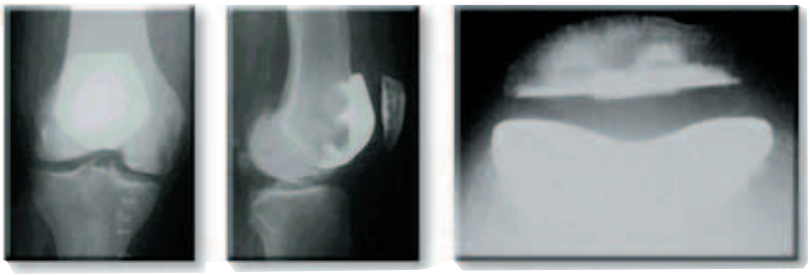
6633-7-746
Clamp Attachment

Case History



A/P Lateral Tangential 30°

Pre-Op
Typical pre-operative X-ray of a patient with severe osteo-arthritis of the patello-femoral joint



A/P Lateral Tangential 30°

Post-Op
Same patient post-operative X-ray

To Facilitate Accurate Patella Tracking

1. Femoral component positioned in slight external rotation (maximum 6°)
2. Femoral component positioned slightly lateral (1-2mm) to the intercondylar mid-line.
3. Anterior cut parallel to the anterior femoral cortex to avoid elevating the trochlear.
4. Release the patello-femoral fold close to the femur.
5. Lateral retinaculum dissected off the lateral osteophyte of the patella to release the lateral retinacular contracture. (A sub periosteal Peri-patella release).
6. Patella measured prior to resection to achieve approximate reconstruction of the original patella thickness.
7. Patella jig positioned so patella resection is symmetrical.
8. Residual patella bone thickness of 12-15mm to reduce the potential for overstuffing of the joint.
9. At full extension, flip the replaced patella at 90° to the trochlear. The retinaculum should be loose enough to allow the edge of the patella to reach medial to the mid-line of the trochlear grove. (Flip test).
10. Shape of the trochlea allows unconstrained movement in extension. The patella is then captured by the groove as the knee flexes to 90°.
11. The patella dome has a 3mm medial offset.
12. The medial patella facet should remain in contact with the medial trochlear and femoral condyle throughout the full range of motion. The patella odd facet will bear against the medial femoral condyle in deep flexion (over 110°). There should be no impingement as the patella rotates internally at 120° and flexion.
13. If any tendency is observed for the medial facet to lift from the femoral trochlear, then a further release of the lateral retinaculum from the border of the patella should be performed. A mid lateral release is avoided to prevent damage to the lateral retinacular vessels and soft tissue hematoma. (This considerably slows recovery).
14. If tracking is not perfect, then a single stitch can be applied to the mid-point of the retinaculum and the tracking reassessed. This simulates wound closure. (Stitch test).
15. If lateral mal-alignment persists then consider tibial tubercular repositioning or revert to a total knee placement.

Clinical Results

The Avon™ Patella has now been available for over five years, since September 1996. The results to date have shown that for the appropriate indications there is considerable improvement in pain and function as assessed by pain scores and the Bartlett and Oxford function scores. The results at 2 years are similar to those obtained from total knee replacement.

At 5 years the results to date show that very good function has been maintained. There have been very few complications attributable to the arthroplasty and no documented cases of wear or loosening. Disease progression in the tibio-femoral joint has occurred in a small number of cases. Results suggest this can occur in about 6% of cases. For those with medial progression, a unicompartmental arthroplasty can be inserted, provided the A.C.L. is intact and the lateral compartment is in perfect condition. Alternatively, proceed to revision with a total knee especially in lateral compartment progression[18].

Preparation and Trial Trays

Avon Patella Instrument Tray

6430-2-200

Patella Instrument Tray

6430-2-100

Product Catalog Info

Avon™ Instruments

6430-1-001	Avon™ Anterior Cutting Guide
6430-1-002	Avon™ Anterior Cut Guide - 2mm Plate
6430-1-003	Avon™ Anterior Cut Guide - 4mm Plate
6430-1-008	Avon™ Anterior Cut Guide - 6mm Plate
6430-1-400	Femoral Alignment Guide
6430-1-450	Femoral Long Alignment Rod
6784-8-145	Mod 1/8" Pins
5800-4-125	Gray Bone Drill 1/8" (3.2mm) x 8" Long
6430-1-020	Avon™ Patella Trial Small
6430-1-030	Avon™ Patella Trial Medium
6430-1-040	Avon™ Patella Trial Large
6430-1-006	Femoral Impactor
6430-1-009	Avon™ 4.5mm Drill
6430-1-010	Avon™ Long Alignment/Intramedullary Rod
6430-1-050	Avon™ Drill Template Extra Small
6430-1-100	Avon™ Drill Template Small
6430-1-200	Avon™ Drill Template Medium
6430-1-300	Avon™ Drill Template Large
6633-7-605	Pin Puller
6430-1-051	Avon™ Femoral Trial Extra Small
6430-1-101	Avon™ Femoral Trial Small
6430-1-201	Avon™ Femoral Trial Medium
6430-1-301	Avon™ Femoral Trial Large

For more information, contact your local Stryker Representative.

Patella Instruments

6776-8-901	Patella Drilling Template Small/Large
6776-8-903	Patella Drilling Template Medium
6776-8-945	Patella Template Attachment
6776-8-909	Patella Drill with Stop
6633-7-736	Patella Resection Guide II
6633-7-744	Monogram Patella Clamp
6633-7-746	Clamp Attachment
6633-7-738	Patella Resection Stylus Guide
6633-7-855	Patella Caliper
6633-8-052	Anterior Reference Indicator

Trays

6430-2-100	Patella Instrument Tray
6430-2-200	Avon™ Patella Instrument Tray
8000-0200	Xcelerate™ Double High Case

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