CHUNLI ORTHOPEDICS GLOBAL INTELLIGENCE

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XK UNI-KNEE

SURGICAL TECHNIQUE

Beijing Chunlizhengda Medical Instruments Co., Ltd

CONTENTS

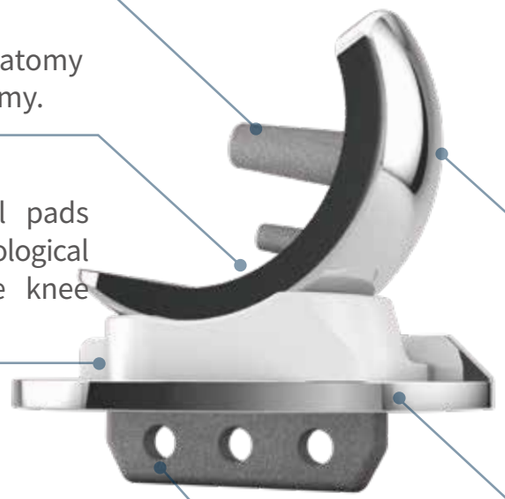
A

Product Description

Double column design to increase the prosthesis anti-rotation stability.

Curved internal anatomy minimizes osteotomy.

Free-moving tibial pads Reconstructs physiological movement of the knee joint.



Single radius positive spherical design allows for Minimize contact stress in all-round activities.

Designed according to the national skeletal characteristics, multiple Various sizes can achieve excellent bone coverage.

Platform wing porous design, conducive to uniform bone cement Distribution, increase the stability of the prosthesis.

B

Indications

The XK unicondylar knee system is primarily indicated for:

- Medial intercompartment with total cartilage loss on both sides and bone to bone contact.
- Unicompartmental osteoarthritis of the anterior medial knee, with intact function of the lateral compartment.
- The patient must be able to flex the knee joint at least 110° under anesthesia.
- Capable of passive correction to the pre-morbid state after application of lateral stress.
- Other conditions suitable for unicompartmental replacement of the knee.
- Have a functionally intact anterior and posterior cruciate ligament.

C

Contraindications

Warn patients of the following contraindications, including:

- Patients with acute or underlying infections, overall or localized.
- Patients with particular osteoporosis, osteopenia, or skeletal dysplasia.
- Periprosthetic fractures of the knee joint.
- Persons with excessive knee flexion or contracture.
- Incompetence of the lateral and anterior and posterior cruciate ligaments that prevent the stability of the fitted prosthesis.
- Those with other diseases affecting postoperative function.
- Patients with traumatic arthritis caused by failed revision of the prosthesis, failed superior tibial osteotomy or fracture of the tibial plateau.
- Chondromalacia.
- Those with acute joint damage, significant bone loss, or bone resorption evident on radiographs.
- Vascular insufficiency, muscle atrophy or neurological disorders.
- Fixed bow-legged deformity greater than 15 degrees (not correctable).
- Flexion deformities greater than 15 degrees.
- Patients with inflammatory arthritis are strictly prohibited from unicondylar knee replacement.

D

Preoperative X-ray template measurement

- The femoral condyle can be selected preoperatively using an x-ray template. To obtain accurate template measurements, a true lateral knee film must be used. Use the template to trace the outline of the medial femoral condyle on the radiograph. The extension of the mid-post of the prosthesis should be flexed 7 degrees compared to the long axis of the femoral stem, and the outer surface of the prosthesis schematic should be located approximately 2 mm lateral to the x-ray image, which is the thickness of the articular cartilage. For the exact type of prosthesis, the proximal portion of the prosthesis should be located approximately 2 mm lateral to the proximal bone surface of the femoral condyle so that the surface of the prosthesis is flush with the retained proximal cartilage (Figure 1).

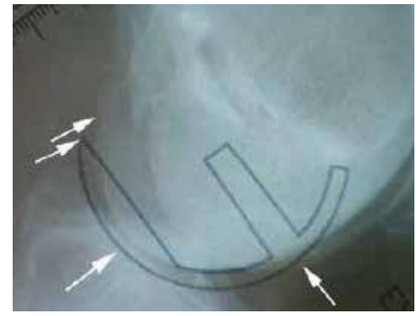


Figure 1

- In TKA, the femoral osteotomy angle determines the postoperative inversion/extrusion alignment. In UKA, the osteotomy angle does not affect the inversion/extrusion alignment; instead, the postoperative inversion/extrusion alignment is determined by the combined thickness of the unicondylar components.

E

Surgical steps

PRE-OPERATIVE PREPARATION

- The position is usually supine.
- The knee is flexed to 90 degrees and a medial patellar skin incision is made from the medial edge of the patella to 3 cm below the joint line (Figure 2). The joint capsule is incised through the skin incision. The upper end of the capsule incision should be extended 2 cm proximally to the medial femoral muscle. The capsule incision then extends downward along the medial edge of the patella to the medial patellar ligament.
- The lower half of the incision exposes the tibial tuberosity to the anteromedial edge of the tibial plateau. As much of the medial meniscus as possible is removed. Do not perform a release of the medial collateral ligament; surgeons in the learning process should widen the surgical incision for better visualization. The patella should be semi-dislocated, not fully dislocated.
- A portion of the posterior patellar fat pad is removed and then a pulling hook is inserted into the synovial cavity to check the integrity of the ACL. (Functional ACL deficiency is a surgical contraindication and if this is found, unicondylar knee arthroplasty should be discontinued in favor of total knee arthroplasty).

Figure 2

Figure 3

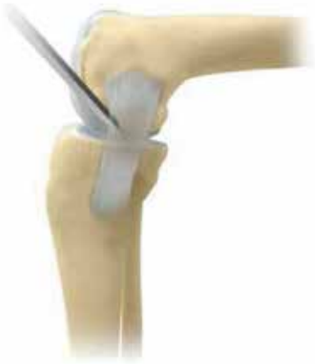


Figure 4

(01)

BONE REMOVAL

- All the bony tuberosities on the medial edge of the medial femoral condyle and on the medial and lateral edges of the intercondylar fossa must be removed (Figure 3). The surgical assistant extends and flexes the knee joint to move the incision up and down so that the entire osteochondral tuberosity can be visualized in the field of view. It is necessary to remove the bony tuberosity anterior to the ACL stop of the tibial plateau and the tuberosity at the top of the intercondylar fossa in order to correct the fixed flexion deformity. If there is a large bony mass around the patella, this should also be removed.

- A curved bone gouge is used to remove the osteochondral tuberosity from below the medial collateral ligament (Figure 4) to the posterior lateral border of the medial femoral condyle. The removal of the superfluous bone provides sufficient space for the next step of inserting the saw blade into the intercondylar fossa.

(02)

TIBIAL PLATEAU OSTEOTOMY

- The knee is placed in the flexed position and the femoral gap is inserted according to the preoperative predicted model gauge with a gauge starting thickness of 1 mm.

  Remove all pulling hooks and assess ligament tension, usually using a 1 mm thick femoral gap gauge to obtain proper ligament tension. If proper ligament tension is not obtained, switch to a 2 or 3 mm thick gap gauge until proper ligament tension is obtained. Check the relationship between the front of the gauge and the approximate cartilage surface position of the patient prior to arthritis to determine the best type of femoral component. The correct gap gauge should be inserted into the center of the medial compartment of the knee.

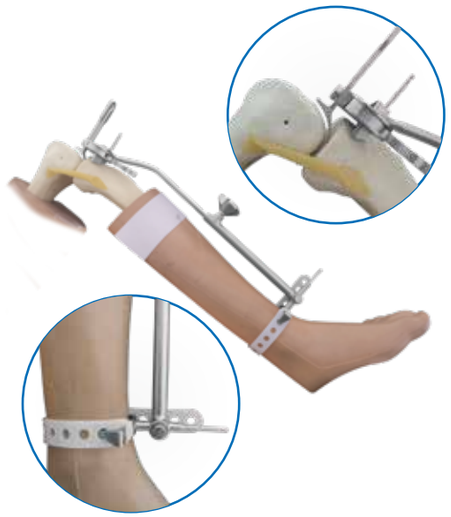


Figure 5

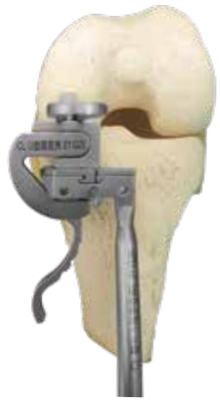


Figure 6

- The tibial osteotomy guide is installed in combination with the force line positioning bar parallel to the tibia (Figure 5). The ankle portion of the guide should point toward the anterior superior iliac spine and use a standard 0 mm tibial osteotomy spacer with a 7-degree posterior tilt of the tibial osteotomy guide. The combination of the gauge, tibial osteotomy guide and G-fixation clip is used simultaneously to determine the plane of osteotomy. The G-fixing clip, size 6 or 7, is selected and attached to the inside of the gauge and tibial osteotomy guide (Figure 6) to ensure proper use of the nail holes.

Note:When fixing the tibial osteotomy guide with pins, the tibial osteotomy guide can be fixed with one capped pin and one uncapped pin in the two medial nail holes, or a pin can be driven into the single nail hole anterior to the guide for fixation to reduce the number of nail holes in the tibia. After fixing the tibial osteotomy guide in place with pins, the G-fixing clip is released and removed along with the gauge.

- Use a condylar plane gauge to confirm that the planned osteotomy plane is correct. The saw blade should be cut 2/3 mm below the base of the bone wear, unless the bone wear is very deep, in which case the osteotomy should be performed above the base of the bone wear. Sagittal osteotomy of the tibia is performed using a reciprocating saw. The saw blade is inserted into the intercondylar fossa near the lateral border of the medial femoral condyle, where the bone has previously been removed. The osteotomy surface should be medial to the apex of the medial tibial spine and pass the edge of the ACL stop. The saw blade is oriented toward the anterior superior condylar spine or flexion plane (as in Figure 7).

Figure 7

- The reciprocating saw must be extended slightly posterior to the tibial plateau. The osteotomy is performed vertically downward until the reciprocating saw reaches the tibial osteotomy surface (Figure 8). Do not lift the reciprocating saw handle, as this will tilt the blade and increase the risk of fracture of the tibial plateau.

Figure 8

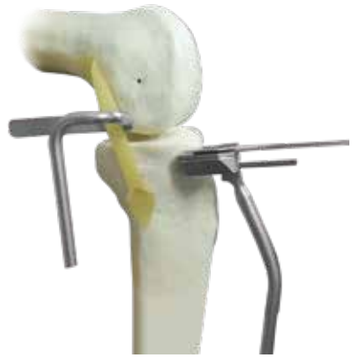


Figure 9

- Prior to the horizontal osteotomy, insert the medial collateral ligament pulling hook, ensuring that the hook is positioned between the MCL and the saw blade, and use the pendulum saw blade to perform the tibial plateau osteotomy (Figure 9). Ensure that the saw blade is osteotomized along the MCL pulling hook for complete osteotomy of the medial cortex. When the tibial plateau is loosened, it is cocked and removed using a bone chisel. It may also be necessary to use a scalpel to remove the posterior medially attached soft tissue.

Note:Slotted tibial osteotomy spacers may be required for horizontal osteotomies, and the appropriate slotted spacer may be used in place of the standard spacer. The slotted tibial osteotomy shims can help maintain a 7 degree posterior tilt during the osteotomy.

- The reverse side of the tibial plateau trial mold is placed on the osteotomy surface of the resected tibial plateau (Figure 10) and the appropriate width prosthesis is selected. If the appropriate width prosthesis appears to be shorter, a repeat sagittal osteotomy at 2 or 3 mm can be considered, allowing for a wider and longer prosthesis.

Figure 10

Figure 11

(03)

FEMORAL DRILLING AND ALIGNMENT

- The knee is flexed at approximately 45 degrees and a ϕ4 drill is used to drill a hole in the femoral medulla. (Figure 11) This operation requires the use of a ϕ5 open-ended drill (Figure 12).

Figure 12

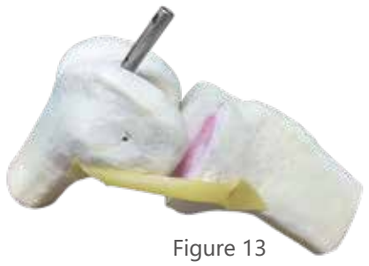


Figure 13

- The femoral drill must be positioned 1 cm anterior to the anterior femoral margin and immediately medial to the medial wall of the intercondylar fossa (Figure 11), with the drill oriented toward the anterior superior condylar spine. The medullary pin is inserted until the medullary pin of the femur reaches the medial surface of the femur (Figure 13).

Figure 14

- Flex the knee joint to 90 degrees. This step must be done with care, as the medial edge of the patella is immediately adjacent to the medullary pin. Using methylene blue or an electric knife, draw a line down to the medial condyle of the femur. A midline locator can be used to assist in drawing the line when determining the medial condyle locator line. (As shown in Figure 14).

- Insert the femoral drill guide to assess the joint space thickness (as in Figure 15).

- The tibial osteotomy thickness must be able to accommodate a femoral drilling guide with an adjustment gap of 6 or 7. If a #6 G-fixation clip is used, the joint space must be able to accommodate a femoral drill guide with an adjustment gap of 6. If a #7 G-fixation clip is used, the joint gap must accommodate a femoral drill guide with an adjustment gap of 7.

Note:The pulling hook must be removed when using the femoral drill guide or depth finder to measure the joint gap; failure to do so can cause soft tissue tension and artificially reduce the joint gap.

Figure 15

- If a proper drilling guide cannot be inserted or is felt to be too tight after insertion, additional tibial osteotomies are required and continued tibial osteotomies require the use of a retriever to remove the initial 0mm tibial osteotomy spacer. After removal of the spacer, the 2 mm tibial osteotomy can be continued below the tibial osteotomy guide. After completing the osteotomy, the joint space is rechecked.

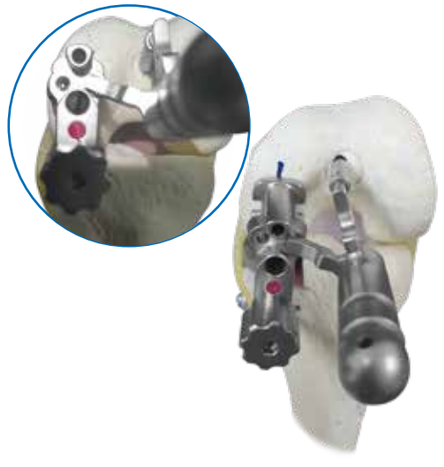


Figure 16

- Insert the locator onto the pith pin and insert its other end into the left/outer hole of the drill guide. This will ensure that the guide is correctly aligned.

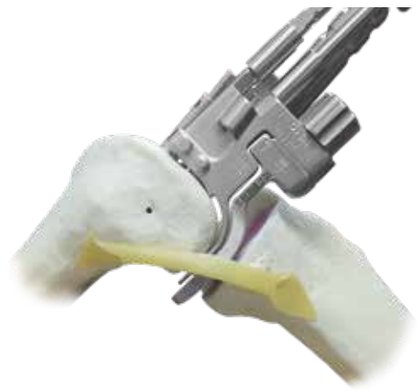


Figure 17

- The femoral drilling guide has two requirements:

1.The femoral drill guide must be located centrally in the medial femoral condyle. This requirement is met by ensuring that the distance from the medial-most and lateral-most risers adjacent to the 6.5 mm hole to the edge of the medial femoral condyle is equal. This can be verified by examining the 6.5 mm hole and confirming the position of the methylene blue positioning line. If the positioning line is not central, adjust the position of the drilling guide.

Note:You can also insert the center line aligner into the 6mm hole and then insert the 2mm needle into the hole of the center line aligner, the needle does not move and pull out the center line aligner, observe whether the needle is aligned with the sub-blue positioning line.

2.A femoral drilling guide must be placed immediately adjacent to the medial femoral condyle, and a φ4 drill bit is passed through the upper square hole of the guide. Drill through the femur and keep it in place. Verify that the guide is aligned and ensure that the guide is not offset medially or laterally. Insert a φ6.3 drill bit in the lower hole of the guide (Figure 15). Remove the drill and the femoral drilling guide.

(04)

FEMORAL OSTEOTOMY

- The posterior condylar osteotome is inserted into the drill hole and struck for fixation (as in Figure 18).

Figure 18

- Using a pendulum saw, the posterior articular surface of the femoral condyle is resected. Press the saw blade downward to bend the blade slightly to ensure that the saw blade is tight against the lower surface of the posterior condylar osteotome for osteotomy (as in Figure 19). Be careful to avoid damaging the medial collateral ligament and anterior cruciate ligament.

Figure 19

Figure 20

Note:Remove the posterior condylar osteotome with a femoral condyle retriever (as in Figure 20), ensuring that it is removed parallel to the holes of the femoral drill guides to avoid damaging these drill holes, and remove the bone block for comparison with the trial condyle (as in Figure 21).

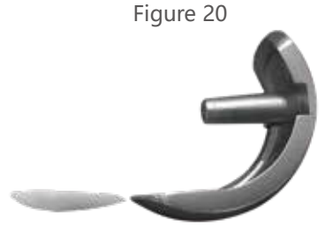


Figure 21

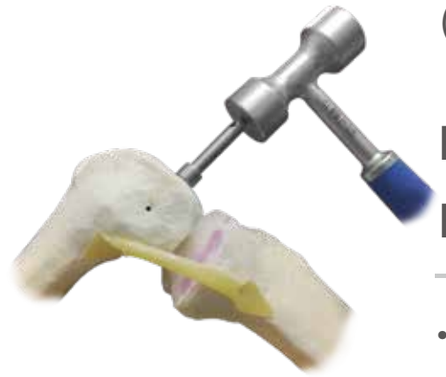


Figure 22

Figure 23

Figure 24

(05)

FIRST LAPPING OF THE FEMORAL CONDYLES

- Insert the No. 0 mill rotator post with the thickest flange into the large drill hole and strike the post until the flange is against the femur (Figure 22). The No. 0 laminator post is the only type of laminator post that can be struck. All other types of grinder posts should be installed with finger pressure.

- Extending the knee slightly and pulling away the soft tissue, the femoral rotation file is mounted onto the rotation post (as in Figure 23) and the incision is inserted to bring the femoral rotation file into contact with the femoral condyles (as in Figure 24). Care is taken to avoid soft tissue entrapment.

- During the grinding process, push the rotary file steadily in the direction of the axis of the rotary column, taking care to avoid tilting the rotary file. Grind until the rotary file can no longer be pushed and the end of the grinder's rotating column is visible.

- If still uncertain, continue grinding; the grinding range of the rotary file cannot be extended beyond the end of the selected rotary column.

Note:

First lapping: The 0# restrictor bar is designed to intercept enough bone to fit the femoral component. The amount of bone intercepted varies with the degree of wear of the femoral condyles.

Secondary lapping: Rotary columns 1-7 can be micro lapped at the first lapping level (in mm). rotary column 3 can cut bone by 3 mm, rotary column 4 can cut bone by 4 mm, and so on.

Continued lapping: If the last rotating post used was #3, the #4 rotating post will allow for a further 1mm of bone trimming. (i.e., 4 mm from the first lapping plane). However, if the last column used is the No. 4 column, a further 1 mm of bone will be cut using the No. 5 column (i.e., a total thickness of 5 mm from the first grinding plane). The rotation post number represents the total osteotomy thickness from the first grinding plane.

The femoral rotation file and rotation post are removed and the bone protruding from the posterior corner of the femoral condyle and located outside the range of the grinder is amputated (e.g., Figure 25). Bone chips on these corners of the osteotomy surface should be removed, but care should be taken not to disrupt the flat posterior surface of the femoral condyle.

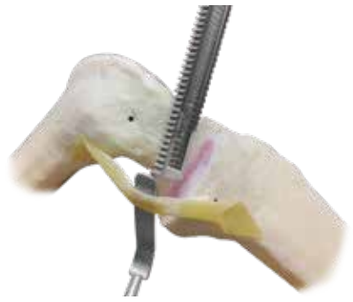


Figure 25

Figure 26

(06)

FLEXION-EXTENSION GAP BALANCE

- With the lower extremity flexed at 100 degrees, insert the metal trial mold and use the trial condyle at 45 degrees to the long axis of the femur, and strike the trial condyle into place with a femoral condyle punch. The flexion gap is carefully measured using a gap gauge (as in Figure 26). Previously, ensure that the gap width can accommodate a gap test pad of at least size 7 thickness (4 mm), and in the smallest patients a gap test pad of at least size 6 thickness (3 mm). The correct thickness can be measured with the knee ligaments in normal tension. In these cases, the depth gauge slides in and out easily, but does not tilt. The proper thickness can be determined by confirming that a 1 mm increase in thickness is too tight and a 1 mm decrease is too loose.

- The gap test pad must be removed prior to knee extension, when the knee extension gap is always narrower than the knee flexion gap. If the gap test pad is not removed, the gap test pad may scratch or cut the ligaments during knee extension; the knee extension gap is measured with the knee in 20 degrees of flexion (not fully extended) (Figure 27). In the fully extended knee position, the posterior joint capsule is tight, which can result in a small measurement. Usually the knee extension gap is less than 4 mm, and if the smallest size gap gauge (1 mm) cannot be inserted, the knee extension gap is considered to be 0 mm.

Figure 27

- Second lapping
  The flexion gap minus the extension gap is the thickness to be continued, for example：If the measured flexion gap is 3 mm and the extension gap is 1 mm, the grinding should be continued by 2 mm, then insert the No. 2 rotation post (Figure 28) and continue grinding until the femoral rotation file can no longer be advanced (Figure 29) After each grinding, the residual bone in the posterior corner of the femoral condyle must be removed (Figure 30).

Figure 28

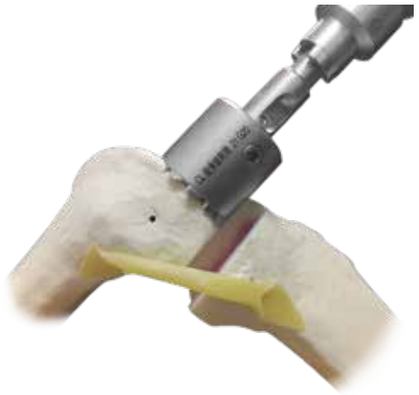


Figure 29

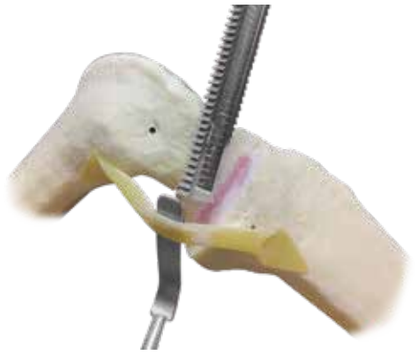


Figure 30

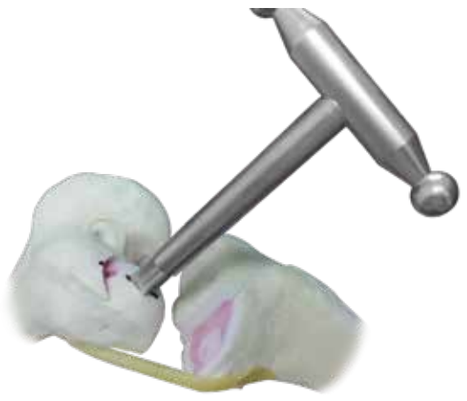


Figure 31

- The equation for balancing the flexion and extension gaps is as follows：
  Flexion gap (mm) - Extension gap (mm) = thickness of femoral condyles continuing to grind the osteotomy (mm) = type of grinder limiting bar used

  Check the osteotomy plane for curved surfaces with a condylar plane gauge.

- If the thickness of the round bone piece under the flange of the rotary column of the grinder is greater than 1 mm, it should be removed using a ϕ12 rotary file (Figure 31). The rotary column does not lose its reference role, because the tip of the rotary column can still be used as a reference for the bottom of the borehole.

Note:The miller rotating column does not lose its reference role and the tip of the miller rotating column can still be used as a reference for the bottom of the borehole.

(07)

CONFIRM FLEXION/EXTENSION GAP BALANCE

- After insertion of the metal trial mold and trial condyles, the knee gap in flexion and knee gap in extension (20 degrees of knee flexion) are remeasured. In general, the knee gap in flexion and the knee gap in extension are the same (Figures 32 and 33). If the knee gap in extension at 20 degrees of flexion is still less than the knee gap in flexion, the grinding osteotomy should be continued. This can be done by using a continuous type of rotating post with 1 mm thickness of osteotomy at a time. In the above example, a 1 mm osteotomy can be performed with a #4 rotating post, and in general, a #3, #4 or #5 rotating post can be used to balance the knee flexion/extension gap.

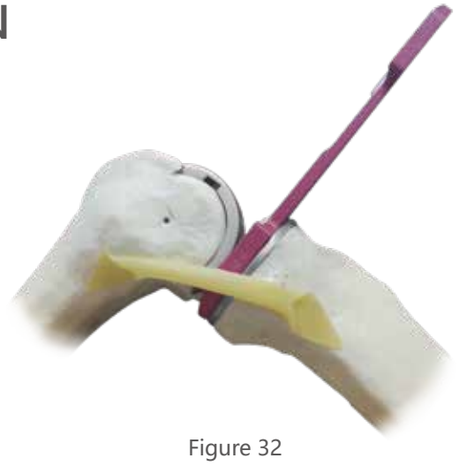


Figure 32

Figure 33

Figure 34

Figure 35

(08)

IMPACT PREVENTION

- The anterior and posterior aspects of the femoral condyles were trimmed to reduce the risk of bone impingement on the tibial plateau pad during full extension and full flexion of the knee.
  After using the femoral revision guide on the femoral condyle (Figure 34) and combining the corresponding type of file head with the quick release joint and sliding bar, the femoral revision file is used to remove the anterior bone and remove the anterior obstruction at full extension of the knee joint. During the grinding process, the file is steadily pushed in the direction of the column axis, taking care to avoid tilting the file. Grind until the femoral file can no longer be advanced (Figure 35).

- Adjust the knee flexion to ensure there is no impingement between the trim file and the tibia. Keeping the femoral revision guide in place, remove all of the posterior osteochondral tuberosity using a curved bone gouge (as in Figure 36). The removal should include the medial, lateral, and medial bone fragments. The guide is removed and the excised bone fragments are removed. Palpate the posterior femoral condyle with the finger to ensure that all bone fragments have been removed.

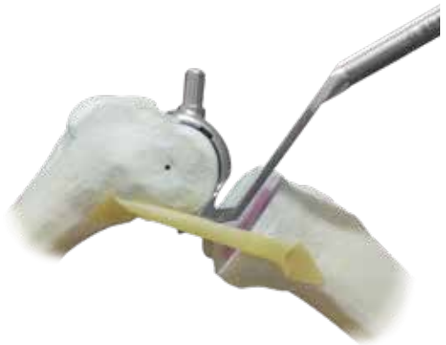


Figure 36

(09)

LOWER COLUMN

- Insert the posterior condylar osteotome and use a short ϕ4 drill bit to make a hole along the posterior condylar osteotome for the inferior riser of the femoral condyle prosthesis (Figure 37).

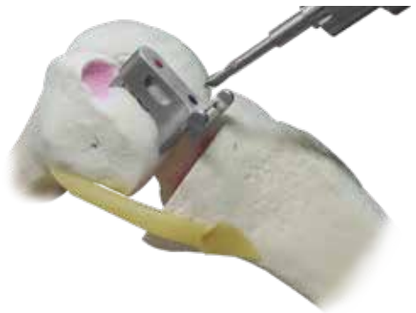


Figure 37

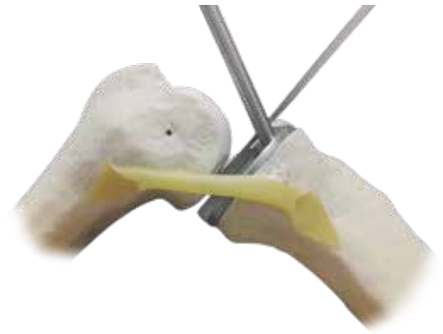


Figure 38

(10)

FINAL PREPARATION OF THE TIBIAL PLATEAU

- Fit and fix the tibial specimen.
  To ensure that the proper type is selected, the posterior edge of the metal specimen should be aligned with the posterior tibial cortex when placed. Passing the retriever through the posterior tibial cortex helps to complete this step. The metal specimen is placed laterally against the sagittal osteotomy surface and secured with tibial pins. The tibial pins should be held during the osteotomy to prevent displacement.

- Osteotomy with a special toothbrush saw blade.
  The toothbrush saw blade is inserted into the slot of the metal trial mold, anterior to the vertical slot and osteotomized until the depth of osteotomy exceeds the width of the saw blade (Figure 38). Oscillate the toothbrush saw up and down as you advance the saw blade backward. Completion of the osteotomy can be confirmed by holding the tibial pin and feeling the saw blade strike the anterior and posterior sides of the osteotomy slot.

- Use a tibial chisel to excavate a bone groove of appropriate depth. Be careful not to disrupt the tibial anterior and posterior tibial cortices (e.g., Figure 39).

  Note:The metal specimen should be aligned with the medial tibial cortex or overhang slightly. If the overhang is more than 2 mm, a smaller tibial plateau prosthesis should be used.

Figure 39

- Verify safe knee motion

  Insert the appropriate type of metal specimen, condyle and tibial plateau specimen pad. Keeping the specimen in place, move the knee within the full range of joint motion to ensure that the bone does not strike the pad in full extension and full flexion (Figs. 40, 41, 42) and that the tibial plateau pad does not strike the vertical wall. If the narrow scalpel inserted between the trial pad and the vertical wall is caught in the pad, a new lateral sagittal plane osteotomy should be considered.

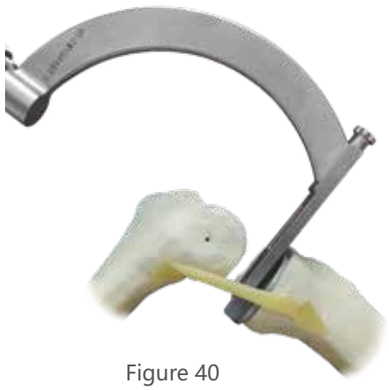


Figure 40

Figure 41

Figure 42

Figure 43

- Use a suitable retriever to remove all test dies.

Note:The individual gaps should be measured previously using a depth gauge, as the gauge will not scratch the ligaments. The posterior lip of the tibial plateau trial pad is 3 mm high, so if the pad is inserted multiple times, the ligaments may be scratched. Take off the specimen to check .

(11)

BONE CEMENT FIXED PROSTHESIS

- Bone cement holes are drilled

  The cemented fixation prosthesis is roughened by drilling multiple small holes in the femoral and tibial surfaces, including the posterior femoral condyle, using a ϕ3 open-ended drill (Figure 43). Two separate mixtures of bone cement are used to fix the prosthesis.

- Tibial Section
  A small amount of bone cement is placed on the tibial osteotomy surface and smoothed to create a thin layer of bone cement covering the entire tibial osteotomy surface. The tibial plateau rest is inserted and compacted downward, first posteriorly and then anteriorly, squeezing out the excess cement in front of the tibia. Complete the tibial plateau insertion process by using a tibial plateau punch and striking with a small hammer. Ensure that no soft tissue is trapped below the tibial plateau rest. Insert the trial condyles and pressurize the bone cement by inserting the appropriate gap trial pad . After insertion of the gap test pad, place the lower extremity in a 45 degree flexion position and wait for cement fixation (Figure 44). Do not fully extend or flex the lower extremity, as this may cause the prosthesis to wobble.

- Femoral condyle portion
  A second portion of bone cement is squeezed into the femoral drill hole and the cement is applied to fill the groove of the femoral condyle prosthesis. The cemented femoral condyle.

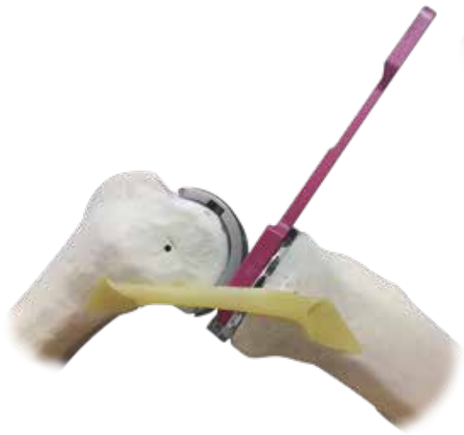


Figure 44

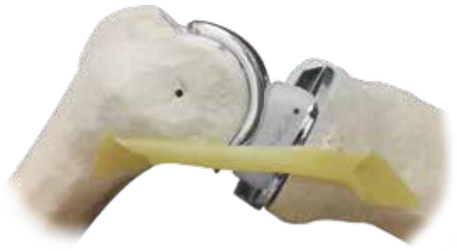


Figure 45

Figure 46

- prosthesis is placed onto the femoral condyle at 45 degrees to the long axis of the femur and the femoral condyle prosthesis is compacted with a femoral condyle pounder. The knee is flexed 45 degrees and held in this position, and a suitable gap trial pad is inserted to apply pressure to the cement (Figure 45). Do not fully extend or flex the knee, as this may cause the prosthesis to wobble and loosen. After the cement has been secured, insert the tibial plateau trial pad and reassess the joint space. Because the cement may reduce the joint space, it may sometimes be necessary to use a smaller tibial plateau trial pad. The tibial plateau pad of the appropriate type is quickly inserted into the joint space to complete the reconstruction process(Figure 46).

(12)

SUTURE INCISION

- After the bone cement has cured and all excess bone cement has been removed, the joint is thoroughly flushed and the soft tissue is closed in a normal layered fashion.

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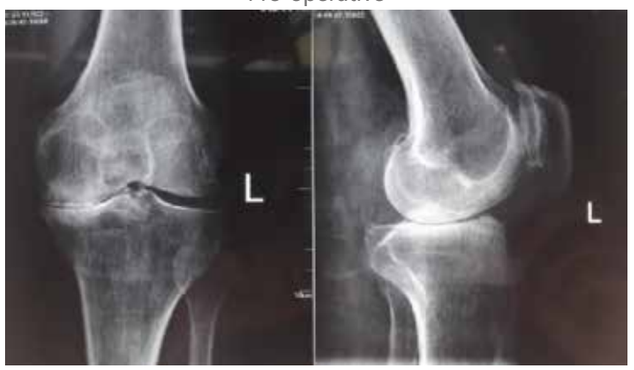
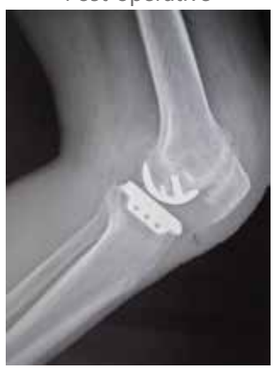
Case examples

Case 1: Patient Bai, male, 63 years old.

Pre-operative

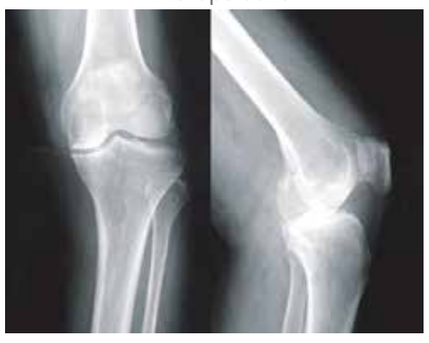


Post-operative



Case 2: Patient Zhong, female, 65 years old.

Pre-operative



Post-operative

G

Technical parameters

Femoral condyles (unit: mm) Model does not distinguish between right and left

XK Femoral condyles	0#	2#	4#	6#	8#	10#	Illustrations
ML	16	17.5	19	20.5	22	23.5	
AP	29.5	32.5	35.5	38.5	41	44	

Tibial plateau pad (unit: mm) Model differentiation left medial knee (L); right

XK type tibial plateau pad	0#	2#	4#	6#	8#	10#	Illustrations
ML	19	20.5	22	24	26	28	
AP	28.5	29	31.5	34	37	40	
Thickness specification: 6、7、8、9、10、11、12、13、14、15							

Tibial plateau brace (unit: mm) Model differentiation left medial knee (L); right

Tibial plateau brace	0#	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	Illustrations
ML	20	22	24	26	26.5	28	30	31.5	33.5	35.5	37.5	
AP	39	42	45	45.5	48.5	51.5	55	58	61	64	67	

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Sterilization

- PROSTHETIC INJECTIONS

The prosthetic implants described in this manual have been sterilized and do not require further sterilization prior to surgery.

• SURGICAL INSTRUMENTS

Surgical instruments are non-sterile and must be sterilized prior to surgery in accordance with the laws and regulations of the country in which they are used, industry regulations and the system of the hospital in which they are used.

I

Surgical tools