Management of Instability (PS, CCK, or Hinge?)

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1. Primary concept

Knee stability is very important for postoperative knee function and satisfaction in total knee arthroplasty. It might be possible to manage knee instability by soft-tissue reconstruction, but here I would like to focus on implant selection for unstable knee.

2. Posterior stabilized (PS) knee

In many cases of knee instability, PCL does not maintain its function. Therefore, PS implants rather than cruciate-retaining implants are usually selected to manage unstable knees. PS implant has mechanism to substitute PCL function, but no constraint for varus-valgus instability. Changing thickness of insert and size of the femoral component is a strategy for control instability in PS knees.

a) Loose in flexion

Varus-valgus instability in knee flexion can be controlled by increasing size of the femoral component. Posterior augmentation is sometimes necessary. In increasing size of the femoral component, we should pay attention so that the femoral component does not overhang of the native femoral bone. When instability still remains after sizing-up femoral component, the use of constrained implant should be considered.

b) Loose in extension

Varus-valgus instability in knee extension may be managed by placing the femoral component in more distally, but usually this method is used for instability due to bone defect. When instability is not controlled with distal positioning of the femoral component and use of thicker insert, constrained implant should be used. In knee extension, we should also check so that hyper-extension is not occurred. Hyper-extension can be controlled only by hinge-implant.

c) Loose in extension and flexion

When the knee is unstable both at knee flexion and extension. Firstly, we should try to manage instability by changing thickness of polyethylene insert as well as sizing and positioning of the femoral component. I recommend flexion gap should be controlled first because extension gap is overestimated without the femoral component due to loosened posterior soft tissue especially when posterior bone defect exists. In use of thicker insert, care should be taken so that the inferior pole of the patella stays above the joint line. When we can not control instability with PS implant, the use of constrained design should be considered.

3. Constraintd Condlyar Knee (CCK)

In case we can not manage instability by implant sizing with PS knees, we need some constraint in implants. CCK design is frequently used to solve this situation. This features a tibial post that engages in a deep femoral box to provide varus-valgus stability. The level of constraint differs between manufacturers regarding varus-valgus constraint, rotational constraint, and post height. In many cases, CCK can manage severe instability, but there are two exceptions. The knee with very large flexion gap would cause posterior dislocation with CCK. Also, CCK does not control hyperextension.

4. Rotational Hinge

Indications for hinge prosthesis are very large flexion gap, which can cause posterior dislocation of CCK. MCL deficiency is also indication for hinge prosthesis because medial stability is clinically very important and it is difficult to stabilized only by CCK mechanism in such cases. Severe genu recurvatum is another indication for hinge prosthesis. Recurvatum should be prevented by proper extension gap, but when it is impossible to control by thicker insert, hinge should be used because CCK does not have any mechanism to prevent hyper-extension. Preventing genu recurvatum by hinge mechanism would have risks for mechanical failure. The patients should be followed up carefully with quadriceps strengthening. Knee brace would be used if necessary.