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Paper #163

"Bone Balancing" in TKR: A Marriage between Gap Balancing and Measured Resection

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Summary:
Bone balancing is a technique in TKR that combines the positive effects of gap balancing and measured resection allowing for a satisfactory alignment and good functional scores

Abstract:

"Bone Balancing" In TKR; a marriage between gap balancing and measured resection

Introduction

There are two opposing views on the preferred technique for TKR.
In "gap balancing" the aim is to achieve a neutral mechanical alignment. This might compromise ligament balance and function but has good long term survival rates.
In "measured resection" the idea is to restore the natural alignment without compromising ligament function thereby improving functional scores. No long-term survival studies are available, compromising alignment might negatively affect long term survival.
We developed a technique, called "bone balancing", which is a compromise between measured resection and gap balancing. This technique allows the surgeon to intra-operatively decide between an alignment, within a set parameters, or in certain cases avoiding a soft tissue release and accept alignment outside the set range. This should avoid unnecessary ligament releases or having an unacceptable alignment that might compromise longevity,

Method

Pre-operative planning is done on long standing X-Rays of the lower limb as well as on a true lateral view of the knee. On the long views the HKA angle is measured. Lines presenting the mechanical axis of the femur and tibia is drawn. Just above and below the joint line a perpendicular line to the mechanical axis are drawn on the femur and tibia. On the femoral side the difference in length from the line perpendicular to the mechanical axis to the most distal point of the medial and lateral femoral condyles is recorded. Bone cuts done parallel to perpendicular lines will result in a neutral alignment. On the lateral view the tibial slope is measured.
Our alignment parameters were between 3° varus - 3° valgus.
In surgery the tibial cut was done first; the coronal plane perpendicular to the mechanical axis, the sagittal plane according to the tibial slope. The femoral cut is done from the tibia with the ligaments balanced. With the knee in full extension the ligaments are balanced with shims, of different thicknesses, from the already cut tibial surface. The difference between the medial and lateral shim thicknesses are recorded; if difference is similar to that on the preoperative planning the femoral cut would result in a neutral lower limb alignment; for every millimetre difference there would be a one degree difference in the alignment from neutral. Where difference was more than 3 mm the necessary ligament release was performed and the knee rebalanced before making the distal femoral cut. No intra-medullary instrumentation was used.
Pre an post-surgery functional scores were recorded.
Alignment X-rays were repeated post-operatively.

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Results

Single surgeon, 121 patients follow up between 6 and 18 months.
10% ligament release, in decreasing order; posterior capsulotomy, lateral retinacular release, ITB and medial ligament.
Oxford scores improved from 26,2 to 42,2; Tegner from 2,5 to 4.4 and SANE from 40.2 to 86.6
Forgotten knee score was 69.8.
7% patients had an alignment outside the set parameters.

Conclusion

"Bone balancing" incorporates the positive aspects of both gap balancing and measured resection resulting in acceptable alignment and good functional scores