Total Knee Arthroplasty (TKA) is a successful clinical intervention for patients with end-stage knee disease that has been performed for over 40 years with good functional outcomes. As a result of the success of TKA, its indications have widened to include younger and more active patients, increasing the demand for the procedure. In the United Kingdom in 2013, over 80,000 procedures were performed and trends indicate that this is increasing annually. The number of revision TKAs is therefore also rising with a projected increase of 601% from 2005 to 2030. Furthermore, greater than 50% of these revision procedures are expected to occur in the younger age groups.

The natural history of these implants is failure, with rates increasing as the interval from surgery increases. Factors increasing the likelihood of revision include poor implant design and manufacture, biological factors and poor surgical technique. However, in spite of continual improvements in surgical technique and implant design, the burden of revision surgery is not decreasing. Further challenges in revision surgery involve an older population with a greater number of medical comorbidities and more bone loss. In addition, revision surgery involves a longer mean operating time, greater mean blood loss, greater complication rate and greater mean hospital stay and cost.

The underlying mechanisms of failure of primary arthroplasties can be broadly divided into three areas. Historically, there have been several examples of poor implant designs and materials which have led to catastrophic failure. Patient factors are also important; these include the failure of TKA to meet patient expectations. Patient related biological factors are another important consideration. Osteolysis is the underlying mechanism of aseptic loosening and thus a major limiting factor in the longevity of joint arthroplasties. Osteolysis occurs secondary to the biological response to wear particles and is a product of bearing surfaces. It can be argued that we have made very little progress in bearing surface technology in the knee. Infection is another important cause of failure that some patients are predisposed to. Finally, deficiencies in surgical technique are associated with worse outcomes.

Data from the national joint registry of England and Wales have also shown aseptic loosening to be the most common etiologic factor for revision TKA accounting for 38% of cases nationwide. This was followed by periprosthetic infections accounting for 24% of the cases. Other important causes include instability, stiffness and fracture. A similar trend in etiology has also been seen in the Swedish and Australian Arthroplasty registry reports. Revision from a UKA to a TKA resulting from disease progression is also a common indication.

An understanding of the failure modes of TKA is important in order for us to improve our practices, reduce the future revision burden and optimize patient outcomes. Moreover, revision TKA for a defined cause is much more likely to succeed that revision undertaken for unexplained pain. The lessons from primary TKA can also be translated to our revisions and can help to avoid further failures.
It is generally accepted that complications are reduced with arthroplasty performed by high-volume surgeons and in high-volume surgical institutes. It is in these scenarios where best operative technique, such as correct positioning of the components, is facilitated. The current challenge is to channel TKA education towards appropriate patient and implant selection, and to facilitate the procedure so that it can be successful in more hands on a global basis.

In conclusion, revision total knee arthroplasty is a growing burden worldwide with a broad etiology. Underlying reasons for failure are multifactorial and it is only by understanding these mechanisms that we can hope to improve the long-term outcomes of knee arthroplasty.

References:

www.njrcentre.org.uk


