



We'd like your views – write to: The Editor, *Bone & Joint*³⁶⁰,
22 Buckingham Street, London WC2N 6ET or email editor360@boneandjoint.org.uk

The future of knee arthroplasty

Dear Sir,

Total knee arthroplasty (TKA) represents the gold standard for the definitive treatment of advanced osteoarthritis of the knee. However, despite the good or excellent results that many of these implants have demonstrated throughout the years in terms of survivorship and surgeon satisfaction, a discrepancy still exists between the objective scores and the personal satisfaction of the patients.

The solutions proposed by both manufacturers and surgeons to reduce this discrepancy have focussed on a reconsideration of the entire procedure, including improvement in surgical technique and instrumentation, more anatomical designs that allow more natural kinematics, and post-operative care. As expected, these theoretical improvements still need the proof of time. Meanwhile, new problems have arisen.

In the past ten years the concept of minimally invasive TKA has been introduced into current practice with variable results.^{1,3} After an initial great enthusiasm, different publications showed poor results while a large number of complications persuaded many surgeons to desist and to return to more classical approaches. Despite this, the innovation encouraged surgeons and researchers to better understand the reasons for failure and for the unsatisfactory results claimed by some patients. Consequently, industry designed new implants, addressing the so-called unmet needs of surgeons and patients. Better-fitting designs, as well as high-flexion prostheses with fixed or mobile bearings were introduced^{4,5} to better accommodate the anatomy and to improve the results for high-demand patients. At present the literature is still debating if these new solutions significantly affect, in a positive way, the results when compared with standard implants.

However, this trend towards less aggressive approaches has achieved some important improvements such as a new generation of smaller but precise instruments purposely designed for these new techniques, as well as prosthetic elements adapted to smaller incisions.⁶ Furthermore, the philosophy of respecting the extensor mechanism and a reduction in soft-tissue mobilisation have created the concept of tissue-sparing surgery, which is an important inheritance. However, the general impression is that these innovations have somehow missed the opportunity to restore normal kinematics to the knee. Indeed, for any design of TKA, from classic to modern-day, this purpose has not been achieved.

This is perhaps because osteoarthritic changes of the knee, be they primary or post-traumatic, do not always involve all three compartments simultaneously (two tibiofemoral and one patellofemoral). Moreover, more attention is being paid to the patellofemoral joint,

which itself can impair the activities of normal daily living such as climbing or descending stairs, rising from a chair, or even keeping the knee bent in the sitting position.

The traditional way of addressing these degenerative changes, when other methods have failed – for example, conservative treatments such as hyaluronan injections, orthotics, rehabilitation, or limited surgical acts such as arthroscopy or osteotomy – has, in the majority of cases, been a TKA even in the presence of single or bicompartamental disease.

However, TKA may be seen as overkill because it sacrifices healthy portions of the knee, as well as one or both cruciates, thereby eliminating normal kinematics and proprioception of the knee. Proprioception is critical for good knee function, both in young and active patients, as well as in elderly subjects with normal functional demands.

Uni, bi-uni and patellofemoral replacements are not new concepts, a feature that has already been shown by different authors.⁷⁻¹⁰ However, nowadays surgical solutions other than TKA must be considered, exploiting the technical possibilities offered by the newer designs of prosthesis which have improved the results of already established implants.

If unicompartmental knee arthroplasty is nowadays a well-established and accepted procedure, very few papers are present in the literature on combined implants. Those that exist^{11,12} present old-fashioned implants with results that are good, but not excellent, especially in terms of survival.

This new interest has been proven by the launch of a design of femoral component that specifically addresses the combination of medial and patellofemoral osteoarthritis, to be implanted with a unicompartmental tibial plate.¹³ However, the clinical results presented so far are unsatisfactory because of the highly demanding surgical technique and the difficulties in reproducing the correct anatomy and kinematics.

Nevertheless, we are entering a period where partial osteoarthritic changes can be addressed with partial prosthetic solutions such as uni, bi-uni, or patellofemoral replacement alone. Other designs of unicompartmental replacement also exist that respect the cruciate ligaments and achieve maximum bone preservation, which is vital in young patients. New materials, new designs, new instruments and an improved level of skill will open these indications to a wider number of patients and to a broader age range.

We thus advocate a different way of looking at the surgical indications for osteoarthritis of the knee. Think first of partial substitution and, should this be impossible for any reason, only then think of TKA.

Professor Francesco Benazzo, Chairman, Clinica Ortopedica e Traumatologica, Università degli Studi di Pavia, Fondazione IRCCS Policlinico San Matteo Pavia, Italy

REFERENCES

1. **Gandhi R, Smith H, Lefavre KA, Davey JR, Mahomed NN.** Complications after minimally invasive total knee arthroplasty as compared with traditional incision techniques: a meta-analysis. *J Arthroplasty* 2011;26:29-35.
2. **Khanna A, Gougoulis N, Longo UG, Maffulli N.** Minimally invasive total knee arthroplasty: a systematic review. *Orthop Clin North Am* 2009;40:479-489.
3. **Cheng T, Liu T, Zhang G, Peng X, Zhang X.** Does minimally invasive surgery improve short-term recovery in total knee arthroplasty? *Clin Orthop Relat Res* 2010;468:1635-1648.
4. **Kim YH, Choi Y, Kim JS.** Comparison of standard and gender-specific posterior-cruciate-retaining high-flexion total knee replacements: a prospective, randomised study. *J Bone Joint Surg [Br]* 2010;92-B:639-645.
5. **Maniar RN, Singhi T.** High-flex rotating platform knee implants two- to 6-year results of a prospective study. *J Arthroplasty* 2011;(Epub ahead of print) PMID: 21945080.
6. **Benazzo F, Rossi SM.** Modular tibial plate for minimally invasive total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 2011;(Epub ahead of print) PMID: 22113217.
7. **Fuchs S, Tibesku CO, Frisse D, et al.** Clinical and functional comparison of uni- and bicondylar sledge prostheses. *Knee Surg Sports Traumatol Arthrosc* 2005;13:197-202.
8. **Confalonieri N, Manzotti A, Cerveri P, De Momi E.** Bi-unicompartamental versus total knee arthroplasty: a matched paired study with early clinical results. *Arch Orthop Trauma Surg* 2009;129:1157-63.
9. **Lonner JH.** Patellofemoral arthroplasty. *Orthopedics* 2010;33:653.
10. **Lombardi AV, Berend KR, Berend ME, et al.** Current controversies in partial knee arthroplasty. *Instr Course Lect* 2012;61:347-381.
11. **Heyse TJ, Khefacha A, Cartier P.** UKA in combination with PFR at average 12-year follow-up. *Arch Orthop Trauma Surg* 2010;130:1227-1230.
12. **Parratte S, Pauly V, Aubaniac JM, Argenson JN.** Survival of bicompartmental knee arthroplasty at 5 to 23 years. *Clin Orthop Relat Res* 2010;468:64-72.
13. **Palumbo BT, Henderson ER, Edwards PK, et al.** Initial experience of the Journey-Deuce bicompartmental knee prosthesis: a review of 36 cases. *J Arthroplasty* 2011;26(6 Suppl):40-45.