Early osteoarthritis of the knee: from conservative to surgical management

Pier Francesco Indelli, Michele Giuntoli

Department of Orthopaedic Surgery and Bioengineering, Stanford University School of Medicine, Stanford, USA and PAVAHCS, Palo Alto, CA, USA
Correspondence to: Pier Francesco Indelli, MD, PhD. Department of Orthopaedic Surgery and Bioengineering, Stanford University School of Medicine, PAVAHCS—Surgical services, 1801 Miranda Ave, Palo Alto, CA 94304, USA. Email: pindelli@stanford.edu.
Comment on: Sabatini L, Conti A. Controversies in treatment of early osteoarthritis of the knee. Ann Joint 2017;2:16.

Submitted Aug 06, 2018. Accepted for publication Aug 13, 2018.
doi: 10.21037/atm.2018.08.18
View this article at: http://dx.doi.org/10.21037/atm.2018.08.18

The number of young patients affected by knee osteoarthritis is increasing exponentially, due to the increasing number of individual involved in physically demanding careers and sporting lifestyles (1,2). Many patients report increasing joint pain, stiffness, loss of function leading to a reduction of their activities of daily living (ADL) (3). Historically, the first approach to this degenerative disease is conservative: patient education, low-impact exercise, bracing, non-steroidal anti-inflammatory drugs (NSAIDS) and intra-articular injections represent a well-recognized first line treatment. Unfortunately, these conservative measures present a limited success rate and possible complications, especially in the presence of a high grade of the osteoarthritic disease (4). Modern biotechnologies have been recently proposed to address early knee osteoarthritis, especially in young and metabolically active patients. If the use of own patient blood derivates (as platelet reach plasma—PRP) is still under debate by the current literature, the application of patient specific mesenchymal stem cells (MSCs) is obtaining an increasing interest (5). When traditional and/or modern conservative treatments fail to improve patients' quality of life, the surgical treatment plays a major role. In this scenario, the recent issue on "*Controversies in treatment of early osteoarthritis of the knee*", published in "*The Annals of Joints*" by Luigi Sabatini Ed., represents a comprehensive overview on the current "state of the art" surgical treatments for the treatment of knee osteoarthritis in the young patient (6).

Sabatini *et al.*, in their introduction to the "*Controversies in treatment of early osteoarthritis of the knee*", suggest for identification and treatment of the knee osteoarthritis as early as possible to delate the progression of this highly degenerative disease (6). The senior Editor emphasizes the need of identifying the most common risk-factors especially in the young and active high-demanding patients: in the same patients' population, once conservative treatments fail, a surgical approach becomes mandatory. In this scenario, the same Editor proposes two main surgical treatments, both having pros and cons. If osteotomies (high tibia or distal femur) present some advantages (i.e., return to active lifestyle) at the cost of a longer rehabilitation time, partial knee replacements [unicompartmental knee arthroplasty (UKA) and bicompartmental knee replacement (BKA)] represent an intriguing treatment option too: both treatments allow for preservation of native ligaments and do not exclude a future conversion to a primary total knee arthroplasty (TKA).

Regarding the UKA option as a treatment of medial knee OA, Atzori *et al.*, in their article "*Medial Unicompartmental Knee Arthroplasty*", analyse the current indications, the overall results, their experience and the most common causes of failure and revision (7). The same authors highlighted the importance of careful patient selection in order to avoid implant failure and showed that the UKA high failure rate reported by the 1990s literature, was mainly due to the malposition of the prosthetic components associated with non-anatomical implants design. The same authors report good results at 2 years mean follow-up in their own series and propose a simple and reproducible method to evaluate femoral component flexion on lateral X-rays. We definitely agree that correct patient selection associated with correct components positioning represent

the key factor for a successful UKA: evolution in the design and improved instruments have allowed, in recent years, a wider use of UKA with encouraging clinical results (8-11)

Isolated patello-femoral OA (PFOA) represents a challenge, especially in young and active patients. Berruto *et al.*, in their article on "*Patellofemoral Knee Arthroplasty*", reviewed potential benefits but also presented several concerns regarding this surgical procedure (12). Traditionally, isolated PFOA is an uncommon condition, often related to several risk-factors such as previous recurrent patello-femoral dislocation, fractures and patella-femoral dysplasia (13). As reported by these authors, early PFOA might be successfully treated by standard conservative treatments: unfortunately, in the most advanced scenario, conservative treatments tend to fail and surgical treatments become mandatory. The results of many surgical techniques are still controversial: first generation prostheses (Inlay) were related with poor outcomes, while better results were reported with Onlay designs and with Inlay second generations. Because extension of the disease to the contra-lateral compartment is a common scenario, patello-femoral arthroplasty associated with UKA represent an interesting treatment option, especially in younger patients with the goal of procrastinating a future TKA.

In another article ("*Lateral Unicompartmental Knee Arthroplasty*"), Imarisio and Trecci reviewed the current literature on the indications, surgical aspects and results of lateral UKA (14). Because of its high technical demanding aspects, lateral UKA is an uncommon procedure. Isolated lateral compartment OA is often related to a valgus knee deformity where soft tissue tension might be compromised: in fact, ACL, PCL and collateral ligaments must to be functionally and anatomically intact in order to proceed with UKA. UKA outcomes are strictly related to surgical technique and positioning of the components. In particular, correct positioning of the femoral component is difficult to obtain because it is highly operator dependant. Unfortunately, the results reported in the literature are heterogeneous and difficult to compare due to the use of different surgical techniques and different prosthetic implants in multiple reports. A critic to this article, may be the fact that the authors didn't take in account modern technical innovations, as robotic and navigation, which already represent an available and proven technology showing good early results.

High tibia osteotomy (HTO) and distal femur osteotomy (DFO) state of the art as a surgical treatment of early knee OA are reviewed in two articles: "*Closing wedge tibial osteotomy*: *is it an actual procedure nowadays?*" by Mattei *et al.* and "*Femoral osteotomies for the valgus knee*" by Olivero *et al.* (15,16). The first review well analyses several aspects of closing and opening wedge HTO: the authors report current indications, compare the two different operative techniques, compare closing wedge HTO with UKA and report major concerns about TKA following closing wedge HTO. Despite closing wedge HTO permits more accurate deformity correction with less morbidity, opening wedge HTO is technically less demanding, presents less risk of neurological injuries and permits a better control of tibial slope leading to a less challenging conversion to TKA. Even if good clinical results have been reported for opening and closed wedge osteotomy, Mattei *et al.* prefer other surgical procedures respect to HTO due to the fact that conversion to a TKA is more technically demanding. As editorialists, we consider HTO a successful procedure when appropriate preoperative indications are met, especially in high-demanding patients with mild to moderate varus knee deformity, as reported by the current literature (17). It has been shown that patients recovering from HTO are able to return to high activities (18).

Regarding DFO, Olivero *et al.* reviewed the recent literature on the indications, surgical techniques and complications of this less common procedure (19). Since valgus knee deformity is a less common finding, the results published in literature are limited. However, good clinical and radiological results are reported both with open wedge and closing wedge DFO. Generically, the closing wedge technique leads to better outcomes, but it is a relatively more demanding procedure with a higher complication rate respect to opening wedge technique: surgeon's preference and technical ability play a role in the decision making process. Recently, cartilage restoration procedures associated with DFO appear to be an appealing solution for the early osteoarthritic knee (20). The current editorialists consider DFO as a viable surgical option, especially in active young patients with an isolated low-grade lateral OA. On the other side, TKA after DFO presents more surgical challenges than primary standard TKA, it is associated with higher perioperative complications and it is often related with inferior clinical results.

Lastly, Risitano *et al.*, in their review "*Total knee arthroplasty after osteotomies around the knee*", evaluated many aspects of the well-known problem of performing a TKA after a previous surgical procedure, such as a DFO or an HTO (21). Although available literature is

limited, most of the published work shows lower clinical and functional results than following a primary implant. This is clearly understandable considering that previous joint surgeries might lead to arthrofibrosis and altered ligamentous balancing. This review also warns about possible complications related to HTO, like non-union, mal-union, developing of patella baja, all making more challenge to obtain a stable and well-balanced prosthetic implant while preserving the bone stock. Moreover, soft tissue management after multiple knee surgeries represents a risk because the presence of already compromised tissue vascularization.

In conclusion, this issue on "*Osteotomies and partial replacement in early osteoarthritis of the knee*", represents an excellent guide for surgeons approaching this clinical scenario. In our opinion, HTO and DFO represent valid surgical options in young and active patients with severe anatomical deformities and related functional limitations. Patients' understanding during the preoperative and postoperative rehabilitative period is mandatory to obtain a satisfactory clinical result: HTO and DFO still lack long-term results and they are still considered as a "bridge" surgery to delay the progression of OA and therefore prosthetic replacement will be on their way. On the other side, surgeons must be ready to address a most challenging procedure when osteotomies fail.

Modern, second generation UKAs are showing an increasing success rate at long-term follow-ups: the availability of modern UKA technologies, such as robotic surgery and intra-operative navigation, allow the surgeon to overcome many reported causes of UKA failure, like implant mal-positioning and mal-alignment. These new surgical devices associated with UKA innovations in design and instrumentation, might allow the surgeon to ultimately save bone stock, making the use of a primary TKA design a viable option if revision surgery will be necessary.

Future challenges are represented by the combination of traditional techniques with modern technologies, as the addition of tissue-engineered biological scaffolds (22,23). Research in this field is growing fast and the goal of reproducing a knee function as close as possible to the native knee is definitely down the road.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. National Institute for Health and Clinical Excellence: National Collaborating Centre for Chronic Conditions Osteoarthritis: national clinical guideline for care and management in adults. London, UK: NICE, 2008.
2. Feeley BT, Gallo RA, Sherman S, et al. Management of osteoarthritis of the knee in the active patient. J Am Acad Orthop Surg 2010;18:406-16.
3. Roos EM, Roos HP, Lohmander LS, et al. Knee Injury and Osteoarthritis Outcome Score (KOOS)--development of a self-administered outcome measure. J Orthop Sports Phys Ther 1998;28:88-96.
4. Sutton PM, Holloway ES. The young osteoarthritic knee: dilemmas in management. BMC Med 2013;11:14.
5. de Girolamo L, Kon E, Filardo G, et al. Regenerative approaches for the treatment of early OA. Knee Surg Sports Traumatol Arthrosc 2016;24:1826-35.
6. Sabatini L, Conti A. Controversies in treatment of early osteoarthritis of the knee. Ann Joint 2017;2:16.
7. Atzori F, Schirò M, De Feo C, et al. Medial unicompartmental knee arthroplasty. Ann Joint 2017;2:39.
8. Lo Presti M, Costa GG, Cialdella S, et al. Return to Sports after Unicompartmental Knee Arthroplasty: Reality or Utopia? A 48-Month Follow-Up Prospective Study. J Knee Surg 2018. [Epub ahead of print].
9. Jamali AA, Scott RD, Rubash HE, et al. Unicompartmental knee arthroplasty: past, present, and future. Am J Orthop (Belle Mead NJ) 2009;38:17-23.
10. Kleeblad LJ, Borus TA, Coon TM, et al. Midterm Survivorship and Patient Satisfaction of Robotic-Arm-Assisted Medial Unicompartmental Knee Arthroplasty: A Multicenter Study. J Arthroplasty 2018;33:1719-26.
11. Millar LJ, Banger M, Rowe PJ, et al. A five-year follow up of gait in robotic assisted vs conventional unicompartmental knee arthroplasty. Gait Posture 2018;65 Suppl 1:31-2.
12. Berruto M, Tradati D, Ferrua P, et al. Patellofemoral knee arthroplasty. Ann Joint 2017;2:48
13. Stefanik JJ, Zumwalt AC, Segal NA, et al. Association between measures of patella height, morphologic features of the trochlea, and patellofemoral joint alignment: the

MOST study. Clin Orthop Relat Res 2013;471:2641-8.
14. Imarisio D, Trecci A. Lateral unicompartmental knee arthroplasty: a review of literature. Ann Joint 2017;2:28.
15. Mattei L, Lea S, Nicolaci G, et al. Closing wedge tibial osteotomy: is it an actual procedure nowadays? Ann Joint 2017;2:30.
16. Olivero M, Rosso F, Dettoni F, et al. Femoral osteotomies for the valgus knee. Ann Joint 2017;2:31.
17. van Wulfften Palthe AFY, Clement ND, Temmerman OPP, et al. Survival and functional outcome of high tibial osteotomy for medial knee osteoarthritis: a 10-20-year cohort study. Eur J Orthop Surg Traumatol 2018;28:1381-9.
18. Ekhtiari S, Haldane CE, de Sa D, et al. Return to Work and Sport Following High Tibial Osteotomy: A Systematic Review. J Bone Joint Surg Am 2016;98:1568-77.
19. Olivero M, Rosso F, Dettoni F, et al. Femoral osteotomies for the valgus knee. Ann Joint 2017;2:31.
20. Cameron JI, McCauley JC, Kermanshahi AY, et al. Lateral Opening-wedge Distal Femoral Osteotomy: Pain Relief, Functional Improvement, and Survivorship at 5 Years. Clin Orthop Relat Res 2015;473:2009-15.
21. Risitano S, Bistolfi A, Sabatini L, et al. Total knee arthroplasty after osteotomies around the knee. Ann Joint 2017;2:26.
22. Leonardi E, Indelli PF. In vitro isolation and characterization of Mesenchymal Stem Cells (MSCs) from lipoaspirate: a Preclinical Protocol. Aperito J Cell Mol Biol 2016;2:109-22.
23. Filardo G, Di Martino A, Kon E, et al. Midterm Results of a Combined Biological and Mechanical Approach for the Treatment of a Complex Knee Lesion. Cartilage 2012;3:288-92.

Cite this article as: Indelli PF, Giuntoli M. Early osteoarthritis of the knee: from conservative to surgical management. Ann Transl Med 2018;6(20):398. doi: 10.21037/atm.2018.08.18

