Recent advances in ligamentous, meniscal and joint-preserving knee surgery: Pushing the limits

Significant advances in arthroscopic and minimally invasive techniques have changed knee surgery over the past decades. In addition, many scientific studies have been performed, improving our understanding of knee structures and their role in the joint function. Knee surgery is in a period of rapid transformation with new therapeutic tools and modern treatments. Surgeons face the challenge of meeting patients' expectation to restore their knee joint function with painless procedures, durable results and fast recovery. Contemporary literature highlights the important role of joint-preserving knee surgery in optimising outcomes for patients. Let us explore in this issue what this means for early knee osteoarthritis, ACL and meniscus treatment.

1. Osteotomy

Over the last decade, orthopedic surgeons experienced the rebirth of their oldest procedure; knee osteotomy. The addition of new technologies to the extensive knowledge collected by surgery's pioneers, has led to the increasing popularity of modern osteotomy strategies as well as their spread across the globe [1]. In the present journal, Miettinen et al. [2] report an excellent survival rate (78% at ten years) using modern implants. However, our understanding of this procedure remains very limited. The papers published in this OTSR issue will provide insights to improve patient outcomes.

Osteotomy planning requires a definition of normality among healthy individuals, with most of the literature on the subject consisting of small series of arthritic patients and some rare studies focusing on what lower-limb alignment "is" within the Caucasian population. In this present issue, Siboni et al. [3] exhibited that neutral lower-limb alignment, resulting from a valgus femur and a varus tibia, was the most common morphotype in Caucasian individuals, allowing a "normal" range of bony anatomy to be defined and used in various knee surgery.

Planning an osteotomy also requires a mechanical vs. anatomical compromise, indeed, the surgeon will aim to correct articular biomechanical issues by correcting bone anatomy.

Certainly, the planning session estimates the angle needed to shift the weight bearing line (Mikulicz line [4]) in the proximal metaphysis of the tibia, from a preoperative position to a virtual "postoperative" position above the tibial plateau. The intersection between the Mikulicz line and plateau is called the Fujisawa point which is expressed as a percentage of the global tibial width.

Tripon et al. [5], simplify the need for a complex ratio calculation by defining that the lateral spine can be used as a very robust landmark for the 55% of Fujisawa (most commonly used reference point in planning of varus knee osteotomies).

Finally, various surgical enhancement have been suggested in the last year, for instance patient specific cutting guides are mostly advised for use in complex cases [6], when navigation is no longer mainstream[7]. The manuscript proposed by Elhinger et al. [8], demonstrated that optimal planning is equivalent to intraoperative use of navigation to obtain accurate correction of the tibial metaphysis.

2. Meniscus

In 2022 the understanding of the meniscus anatomy [9], biomechanics [10], and pathologies is certainly at the forefront of orthopaedic discussions. In terms of anatomy, numerous ligaments attaching the meniscus to the tibia have been highlighted. Mariani et al. [10] reported that meniscal extrusion is not only due to root lesions but also related to meniscotibial ligament injuries. Thus, they should be considered at presence, given we possess the knowledge to identify, treat, and repair root lesions.

During ACL reconstruction, ramp lesions of the medial meniscus are seen in 22% of cases [11]. Surgical treatment is technically demanding. It often requires a posteromedial approach but a double posteromedial approach [12] (or a transseptal approach [13]) is a better option in terms of access, visualisation, and suture placement.

Complex lesions such as radial tears of the lateral meniscus should be repaired, even if located in the anterior portion and related to horizontal cleavage [14]. Complex lesions can be repaired with good success rates [15].

When the meniscus is absent or irreparable, some salvage procedures exist. Wrapping techniques [16] may help surgeons treat certain complex lesions in young patients [17]. However, investigations on patients are required to determine proper indications and limits.

Meniscectomy is still one of the most popular and frequent orthopaedic procedures in the world, despite the outstanding number of scientific guidelines and consensus against it [18,19]. The scientific literature also indicates the advantages of meniscal repair procedures and preservation of traumatic tears and non-removal procedures, rather than meniscectomy in degenerative meniscal lesions. Furthermore, the gap between scientific recommendations, consensus between expert opinions and daily practice remains high. The issues around reimbursement of meniscal suture devices

in France are new and the impact of this on the indications in meniscus surgery must be carefully addressed. Scientific research and investigations should continue in order to repair menisci when indicated, for the benefit of the patient.

3. Anterior cruciate ligament

Not all anterior cruciate ligament (ACL) injuries are created equal, nor are all ACL deficient patients one and the same. There has been increasing recognition of the spectrum of laxity seen in ACL injured knees. Ongoing work to identify factors contributing to this spectrum could help inform individualised treatment strategies for ACL injured patients.

In this issue of the Journal, the article by Ahn et al. [20], explores the contributions of the anterolateral ligament and the anterolateral capsule in controlling tibial internal rotation, anterior translation and varus angulation. Importantly, the iliotibial band was preserved in the cadaveric model. The authors eloquently highlight increasing laxity with sequential sectioning of these secondary stabilisers. Accurately and reliably identifying and grading injury to these structures (radiologically or otherwise) in the clinical environment remains challenging. Progress in doing so will be important to refine decision making at the individual patient level. Recent clinical trials have highlighted the efficacy of anterolateral procedures in a subset of ACL injured patients, however, continued refinement as to the specific indications for anterolateral surgery is required.

There has been renewed interest and an ever-growing body of evidence regarding ACL repair in selected patients using contemporary surgical repair techniques. This further reinforces the concept that not all ACL injuries are the same. Despite the advantages of a successful ACL repair, failure remains a concern and the indications are relatively narrow. The manuscript of Cao et al. [21] explores the potential for biological augmentation to reduce failure rates and thereby potentially expand the role of ACL repair. The challenges ahead in researching the optimal biological augmentation and specific indications for ACL repair are highlighted in the review. The wide variety of options for biological augmentation is demonstrated in the literature, as are the differing thresholds for ACL repair and definitions of failure. Encouragingly, the authors found a reduction in the proportion of patients with a side-to-side difference of >3 mm when biological augmentation was used and further, improved patient-reported outcomes. This is an important manuscript in a rapidly growing field. It is anticipated that updated systematic reviews in years to come will have much larger numbers and allow comparison between specific biological interventions.

Disclosure of interest

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LB declares that he has no competing interest.

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