Trochleoplasty has long been a feared and avoided surgical procedure because it is ill understood on the one part and technically demanding on the other. The procedure is bestowed with further awe and uncertainty because of the rarity of its appropriate indications. The landmark study of Carstensen, Feeley, Tyrrell-Burrus, Deasey, Rush, and Diduch entitled “Sulcus Deepening Trochleoplasty and Medial Patellofemoral Ligament Reconstruction for Patellofemoral Instability: A 2-Year Study” reports mid-term outcomes of 44 patients treated with sulcus-deepening trochleoplasty and medial patellofemoral ligament reconstruction for lateral patellar dislocation. The authors should be commended for demystifying the procedure by clarifying the underlying role by which trochlear dysplasia affects patterns of patellar dislocation. It is interesting to note that Richerand (1807) had suggested from a study of 3 knees that the cause of patellar dislocation may be that the “external condyle of the femur, naturally more eminent anteriorly than the internal one, may be depressed.” A century later, Drew (1908), describing the work of Pollard (1890), noted that “the femur is ill developed or ill shapen” in patients with recurrent patellar dislocation and described the first trochleoplasty to correct such deformity by deepening the trochlear sulcus. Screening for trochlear dysplasia sunk into oblivion until Brattström (1964) introduced some thresholds for the assessment of trochlear dysplasia based on axial-view images; later, Maldague and Malghem (1985) started to examine the depth of the trochlea on the sagittal view.

In 1987, my father, Henri Dejour, described the crossing sign, pathognomonic of trochlear dysplasia, and proposed a classification of 3 grades depending on the level of this crossing sign on the sagittal view. I then improved this classification (1998) to assess the trochlear shape and overhang by the presence of a supra-trochlear spur on true lateral radiographs. This could be done using paired radiographs and slice imaging (computed tomography or magnetic resonance images) to perform cross-sectional examination of the global shape of the trochlea (shallow, flat, or convex), whether overhanging or not. Since then, many articles have proved that trochlear dysplasia is one of the main risk factors for patellar instability and recurrent dislocation. It is worth noting that misunderstanding or undervaluation of trochlear dysplasia leads to inappropriate or
failed surgery, the iatrogenic complications of which are well-known pitfalls of patellofemoral (PF) surgery. Why is this so? In my experience, many surgeons miss a key aspect of trochlear dysplasia: the overhang or the prominence of the trochlea relative to the anterior femoral cortex, characterized by a supra-trochlear spur. In their series of 44 patients undergoing sulcus-deepening trochleoplasty, Carstensen et al.\(^1\) reported that nearly half of the patients (45%) had failed prior PF surgery, in close agreement with the proportions reported in my trochleoplasty series.\(^{12,13}\)

Although a shallow trochlea is easy to spot on skyline radiographs or magnetic resonance imaging slices, the extent of trochlear overhang with a potential supra-trochlear spur can only be seen on true lateral radiographs or magnetic resonance imaging slices, in which the posterior femoral condyles are superimposed (under fluoroscopic guidance). If used correctly, my classification should indicate what should be removed, not just from the cartilaginous trochlea, but also from the supra-trochlear bone. Carstensen et al.\(^1\) emphasized the importance of preoperative screening by both radiographic and slice imaging, which is a crucial point. The supra-trochlear spur leads to abnormal tracking, which is more than a simple “J sign,” that results in disengagement of the patella from the trochlea during extension. The symptoms are often exacerbated by patella alta and malalignment of the extensor mechanism and lower limb.

Numerous trochleoplasty techniques have been described, most of which are based on the original sulcus-deepening trochleoplasty described by Henri Dejour or the simplified version described by the Swiss surgeon Heinz Bereiter, who visited Henri Dejour and described technical adaptations to facilitate the technique.\(^14\) With both the thick-flap (Dejour) and thin-flap (Bereiter) techniques, it is possible to restore concavity of the trochlea and congruency with the patella. The principal difference lies in the preservation of cartilage. The Dejour trochleoplasty leaves at least 5 mm of subchondral bone and is definitely less aggressive toward the cartilage, thereby extending indications to older patients or patients with multiple PF antecedents, in whom the trochlear cartilage may be thin and/or damaged. The arthroscopic variant of the Bereiter technique is feasible but very challenging, and in my view, it is impossible for indications that I treat with permanent or habitual dislocation, when there are several other anomalies to correct. In the original technique of Henri Dejour, there was no change in the groove position; I added to the technique a lateralization of the groove, which allowed a “proximal realignment,” sometimes permitting one to not add a tibial tubercle osteotomy. The recent addition of the medial patellofemoral ligament reconstruction is definitely good and mandatory because it restores damaged anatomic structures.

So, finally, surgeons are often frightened by PF patients, and more so by trochleoplasty, because of the risks of degenerative arthritis and the risks of postoperative complications. The literature does not show an increase in arthritis, probably because we observe mostly unipolar lesions on the patellar side, with the trochlea remaining unloaded, and the Dejour trochleoplasty leaves the appropriate amount of subchondral bone and cartilage. The reoperation rates may seem high but are mostly related to arthrofibrosis in complex cases, for which the revision rates are acceptable.\(^15\) The enhancement of postoperative care in terms of rehabilitation programs is a perfect way to improve the results, as shown by Carstensen et al.\(^1\)

I think it has to be understood that trochleoplasty should not be performed as a secondary or revision procedure but rather as a primary procedure with clear indications. Even though the postoperative path might be difficult to handle, patients are able to achieve a better quality of life, given that they have lived in a very pathologic condition since childhood, which prevented their participation in normal activities and adolescent life. The genetic origins of the disease also increase the protectiveness of the parents, who sometimes have the sentiment of guilt of those who try to over-protect them from physical activities.

In conclusion, the technical aspect of sulcus-deepening trochleoplasty is definitely important and challenging. As with all complex surgical procedures, surgeon training helps, but the key point to improve outcomes is to ensure the right indication for each patient, which can only be granted by accomplished knowledge of trochlear dysplasia and its specificities in both the axial and sagittal planes.

References


