



Should Knee Surgeons Know about Trochlear Dysplasia?

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Editorial

According to a study from Onor et al. [1] is Trochlear Dysplasia (TD) is a common knee condition that affects more than 20% of the population. This was the recent findings from five observers who evaluated 692 skeletally mature femoral specimens twice and in another recent ultrasound sound study TD was found to be present in 5% to 10% in a cohort of 203 knees [2]. Those rates are higher than previously recorded and one explanation for the high frequency might be that TD is an abnormality of the knees trochlear groove where there is an invisible transition between what is normal and what is pathologic. However, a knee condition that is so common and a knee condition that can have impact on knee symptoms is naturally of such an importance that every knee surgeon must know about the condition of this abnormal configuration of the trochlear groove, that causes malalignment of the patella tracking. TD has been correlated to patellar instability, patellofemoral pain and patellofemoral osteoarthritis (PF OA). In respect to patellar instability several studies have found it to be the single most important factor for patella dislocation [3,4]. Moreover, has TD been found to be the first or second most important factor for failure of MPFL reconstructions, the surgery that today is the working horse for patella stabilizing surgery [5,6]. TD is difficult to grade, and there is no accepted threshold for doing a trochleoplasty procedure, the surgery that aims to normalize anatomy. A major problem is that there is still no general accepted classification of TD. The most commonly used classification is the Dejour Classification; however the complexity of this classification and the low reproducibility makes it problematic in daily practice. This classification is not based upon measurable parameters and there is a lack of biomechanical background. Today is the 2-grade modification of the classification more used [7]. For patellar instability it has been increasingly popular to use the lateral trochlear inclination angle to evaluate TD [8]. This angle, measured on axial MRI, somehow expresses the trochlear slope of the knee in relation to the posterior femoral condylar line, and thereby how much osseous support the lateral part of the trochlear groove provides to the patella. The measurement of the lateral trochlear inclination has recently been modified to a two-images technique [9], due to following reason; TD is most pronounced in the most proximal part of the trochlea and this is where the patella starts to articulate with the trochlea, when the knee starts to bend and this is the position where the patella dislocate, and therefore this angle must be measured most proximal. However this angle needs to be measured in relation to the posterior femoral condylar line and this is measured at a level more distal where condyles are most prominent. TD is not only characterized by a reduced lateral trochlear inclination angle, but also by other measurable factors are of importance and this makes it very complex to understand and to define. Other characteristics of TD are a reduced depth, and sometimes also a medialized trochlear groove and both can be measured. When the groove is medialized, it is called trochlear asymmetry and this is of substantial importance in order to the so called TT-TG (tibial tubercle trochlear groove distance). An increased TT-TG distance has been mistakenly used to indicate medialization of the tibial tubercle in the belief that it normalized anatomy. Today we know that an increased TT-TG is either a result of a medialized trochlear groove or increased knee rotation [10,11]. Another important aspect is the whether the TD is due to an elevated floor of the trochlea or due a hypoplastic lateral condyle. The elevated floor has biomechanical been related to increased pressure in the patellofemoral joint. When looking at lateral X-rays it's called trochlear bump and when looking at MRI, where it's measured on cartilage, it's called ventral prominence. Biedert and Bachmann correlated the central height of the trochlea to the width of the knee and this can be used to separate if the TD is a result of an elevated floor or a hypoplastic lateral femoral condyle [12]. Conchie et al. found a 7.5 times higher risk of getting PF OA and having patellofemoral pain in adolescence [13]. Could it be that those having patellofemoral pain due to TD are same as those developing PF OA? According to Mofidy et al. [14] patients with isolated PF arthritis show concomitant signs of TD in 78% of the cases. Lately PF arthroplasty have become increasingly popular due to better results and therefore it's important that the arthroplasty surgeon is trained in diagnosing TD, since the likelihood of isolated PF OA is high, when TD is

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observed. How should the orthopedic surgeon and radiologist relate to TD daily? First thing is to be aware that it exists and look for it on X-rays, MRI's and during surgery. TD can easily be seen on straight lateral X-rays just by looking at the so-called crossing sign, however axial MRI is the preferable method of choice. The main theories about the etiology of TD are hereditary due to genetic factors, or a result of stress stimulation of patella, either during fetal life because of knee position in utero (breech position) or eventually reduced patella/trochlea stress forces during growth. All theories seem possible and can coexist. There are reports on families with TD [15-18], and it has been related to a balanced translocation of chromosomes [19]. Ultrasound findings suggest a relationship between TD and breech position [20-22]. However there is also a developmental theory that TD might be induced postpartum and this supported by animal studies since TD can be induced [23-27]. Importantly it seems that TD can be normalized. In a study with patients below 11 years who underwent patella stabilizing surgery, the TD had normalized at follow-up [28]. Another important aspect is that TD has been found to correlate with increased femoral anteversion, and this often makes decisions for surgical interventions complex, since it can be challenging to decide for trochleoplasty or de-rotational osteotomy or both in combination [29-31]. Today is the standard procedure for severe symptomatic TD a trochleoplasty. Much skepticism has been raised towards the trochleoplasty procedure, related to factors like the complexity of the surgery and thereby the risk, but also the lack of good long-time follow-up studies and this might have reduced the rate of spread. Until now there has been no reports on neither lack of cartilage healing, no cases of damaged growth plates and the most common complication seems to be cases of arthrofibrosis, a consequence that likely can be reduced by early mobilization. Trochleoplasty meta-analysis have found good results and low rate of complications [32,33].

In a systematic review was the risk of re-dislocation after patella stabilizing surgery reduced when trochleoplasty was performed, compared to MPFL reconstruction [34]. Only three papers have published on trochleoplasty for chronic patellofemoral pain [35-37]. A very important, but still unanswered question is if trochleoplasty can change the natural degenerative course towards development of PF OA. There is a lack of long-time follow-up studies on trochleoplasty and the results are conflicting. The problem is that trochleoplasty procedure often is done when already a high number of patella dislocations had occurred before the surgery, a factor that correlated towards the development of PF OA. These days' trochleoplasties are done closer to the initial dislocation and are likely to change the long-time prognosis. Finally an important aspect to emphasize is that TD is a condition and not a disease. Many of those having TD will never have knee symptoms.

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