

Comment to the Article “Comparative Assessment of Subtrochanteric Shortening Osteotomy and Paavilainen’s Proximal Osteotomy in Total Hip Arthroplasty for Crowe III–IV Dysplasia”

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Hip dysplasia (HD) is a congenital inferiority of the joint due to its improper development, which can lead to subluxation or dislocation of the femoral head.

Some authors reported that the prevalence of HD ranged from 1.7% to 20.0% in the general population, however, most researchers believed that this indicator varied from 3 to 5% [1, 2]. The highest prevalence of HD is noted in the Scandinavian countries and in a number of Southeast Asia countries [2], as well as in the North Caucasus region [3]. The prevalence of the complete HD in the adult population reaches 10% of all cases of HD*.


• *Comment on the Article*


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Total hip arthroplasty (HA) for HD with the femoral head dislocation is a complex surgery with a high rate of complications, such as dislocation, nonunion or improper nonunion, infection, premature implant loosening, and the sciatic nerve damage. In severe HD, the excessive lower limb lengthening can lead to sciatic nerve injury. The secondary neurological pain and associated muscle weakness can overshadow a well done HA and resulted in patient dissatisfaction. To avoid these complications, it was proposed to perform the proximal or subtrochanteric shortening osteotomy (STSO) if the elongation exceeded 4 cm [4].

In the commented article, A.A. Korytkin et al. pointed out that the most common techniques for shortening osteotomy were STSO and Paavilainen’s proximal osteotomy (PPO). This study is of interest due to the fact that it provides the direct comparison of the two types of operation, performed by the same surgical team. In both cases, there were no statistically significant difference in the duration of the surgery, the amount of blood

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loss, and the functional results of the operation. However, the complication rate was two times higher in the STSO.

Actually, STSO is used much more often and by a significantly larger number of surgeons. The PubMed search for the query “total hip arthroplasty AND shortening osteotomy” over the past decade brought 103 publications, analyzed the results of total HA in severe (Crowe III-IV) HD using shortening osteotomy. Of these, 85 publications described the use of various options for STSO, 8 studies evaluated the results of HA without shortening osteotomy in patients with Crowe IV HD, and only 6 articles evaluated the use of other options for shortening osteotomy (trochanteric, proximal), including 2 works dedicated to PPO. In many works, the authors mentioned the obvious advantages of STSO compared with proximal osteotomy, namely a lower rate of complications, a more predictable result [2, 5].

At the same time, in the majority of publications, the number of cases with STSO varied from 6 to 30 operations [6, 7], several authors report 50–80 cases of this arthroplastic technique [8, 9]. The maximum series of observations was 102 cases of HA with STSO in the patients with Crowe IV HD in the study by Grappiolo et al. [10]. The rate of the osteotomized region nonunion varied from 0 to 20% [6, 11, 12] with survival rate from 80–87% at the follow-up of 5–6 years [12, 13] to 100% at the follow-up of 8 years, however, in only 6 observations [6].

It should be noted that such different results are associated with significant heterogeneity in the surgical technique. The STSO can be transverse, oblique, Z-shaped and chevron-shaped, in combination with various options of bone grafting or without it. But each technique has its advantages and disadvantages. In addition, HA may be performed using the “standard” or modular femoral component and, according to the literature, the best results were obtained using the modular S-ROM system [6, 9]. This femoral

component is almost ideally suited for performing STSO. The round stem is fixed distally in the femoral canal, and the rotational stability of the proximal fragment is carried out by the wide modular proximal part of the femoral component. In turn, the use of standard femoral components requires stable fixation of the stem both in the distal part and in the proximal part of the femur, which is quite difficult technically and often leads to splitting and requires additional fixing elements in the form of cerclages, bone cortical grafts and various plates [2, 14, 15].

PPO implies the separate tasks for fixing the femoral component and tensioning the hip abduction apparatus. At the same time, the method combines the advantage of trochanteric osteotomies in terms of ease of access to the acetabulum and subtrochanteric osteotomies in terms of shortening the length of the femur to prevent neurological complications. In addition, the very first series of observations presented by Paavilainen himself in 1993 comprised 69 observations [16], and later his colleagues presented the long-term effectiveness of these operations [17]. The best results of this operation are presented by Thorup et al, who demonstrated 100% survival in follow-up from 1.5 to 10 years in 19 observations [18]. The greatest experience in total HA using PPO in Russia, and possibly worldwide, was accumulated in the Vreden National Medical Research Center of Traumatology and Orthopedics, St. Petersburg. The first published analysis included 180 operations in 140 patients performed by a single surgeon (prof. R.M. Tikhilov).

The analysis of the medium-term and long-term results showed the average Harris score increased from 41.6 (95% CI from 40.3 to 43.5) to 79.3 (95% CI from 77.9 to 82.7). Early complications accounted for 9%. The most common were the proximal femur fractures. The late complications accounted for 16.7%. These were pseudarthrosis and delayed consolidation of the greater trochanter — 13.9%,

dislocations — 1.1%, aseptic loosening of components — 1.7 %, and revisions 8.3% [19]. The further investigation of this issue based on 561 HA in the patients with a high dislocation of types C1 and C2 by Hartofilakidis allowed the significant improvement of the indicators. The total number of complications (early and late) was reduced to 10%, and overall survival rate was 96.1% with an average follow-up 69.4 months [20]. A significant number of observations made it possible to identify the PPO peculiarities depending on the type of high hip dislocation, to determine the risk factors for delayed consolidation of the greater trochanter, and to establish the indications to refrain from the shorten osteotomy in HA. In particular, the presence of a false acetabulum with type of dislocation C1 according to Hartofilakidis and a relatively small shortening allowed for refraining from performing the shortening osteotomy in 50% of cases [20]. This was confirmed by the works of other authors [21, 22] and showed the heterogeneity of the Crowe IV HD group of patients. Ma et al. even proposed to change the Crowe's classification, dividing the type of Crowe IV into IVA and IVB [23], which already took place in the classification of Hartofilakidis et al. [24].

In conclusion, it should be noted that the results of surgical treatment of patients with high hip dislocation depend on many factors, including anatomical features, the operating team experience, operating room equipment, implants used, etc. Based on the data from published studies, it is impossible to unequivocally conclude that any of the described methods of shortening osteotomy is advantageous. Often, studies were performed on small groups of patients, which did not permit any objective statistical analysis.

It can be assumed that both methods show comparable results, and the choice of the method remains with the surgeon, who, based on personal preferences, experience and technical capabilities, will make the optimal decision on the surgery technique.

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