

Surgical treatment of hip dysplasia through the medial approach

Gelişimsel kalça displazisinin medial yaklaşımla cerrahi tedavisi

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Gelişimsel kalça displazisinin medialden açık yerleştirme ile tedavisi ilk yaşlarda sık uygulanan, etkin cerrahi yöntemlerden biridir. Değişik yaklaşım, tespit ve izleme yöntemleri önerilmekle birlikte, posteromedial girişimle ve artrografiden de yararlanılarak uygulanacak algoritma ile oldukça başarılı sonuçlar elde edilebilmektedir. Medial girişimle yapılan açık yerleştirmenin amacı, displastik kalçada Tönnis I. derece artrografik yerleştirmeyi elde edip devamlılığı sağlamak olmalıdır. Bu yöntemle tedavide görülebilecek sorunlardan biri femur başı avasküler nekrozudur. Bu sorunun gerçek değerlendirilmesi olguların erişkin döneme kadar izlenmesini gerektirse de, sorunun önlenmesinde etkili olan unsurlara (sınırlı girişimsel cerrahi, uygun yerleştirme ve uygun konumda tespit) dikkat edilmesi şarttır.

Open reduction of developmental hip dysplasia by the medial approach is one of the effective surgical treatment methods during early childhood. Although surgical approaches, fixation and follow-up methods may vary, successful results can be obtained by the algorithm involving the posteromedial approach and arthrographic evaluation. The aim of open reduction by the medial approach should be to obtain Tönnis grade I arthrographic reduction of the dysplastic hip and to maintain it. Avascular necrosis of the femoral head is a potential complication of this method. Even though actual evaluation of this problem requires monitoring patients until maturity, it is essential that special attention be given to the most effective factors (minimal invasive surgical technique, correct reduction, and appropriate position for fixation) for preventing this complication.

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gical technique, correct reduction, and appropriate position for fixation) for preventing this complication.

Medial approach in surgical treatment of developmental dysplasia of hip (DDH) was first described by Ludloff. This method was not accepted by others for many years, but was modified and popularized by Mau et al¹ and particularly by Ferguson.² As it became popular, some authors advocated the method^{1, 3-12} while some authors rejected^{13,14} accusing it for high rates of avascular necrosis.

Medial approach may be performed either with a longitudinal or transverse incision depending on the surgeon's choice. Following the incision surgery

may be continued either anterior to adductor longus and brevis as Ludloff described or posterior to adductor longus and brevis as Ferguson described and named as anteromedial or posteromedial respectively.^[15]

We prefer longitudinal incision and posteromedial approach. Despite the longitudinal incision the wound heals cosmetically very nice and results nearly without scar.

Initially^[11] we used to incise and release the joint capsule as Ferguson recommended. Later we observed that in some cases reduction could have been obtained with ease following adductor longus and iliopsoas tenotomies and decided not to incise the capsule and end the surgery following reduction. With this idea we proposed a new algorithm in 1993 and started a multicenter prospective study and reported our results.^[3]

Our indications for surgery consist of; nonteratologic hip dysplasias of 3-18 months aged children without any congenital anomaly and neuromuscular disease which did not receive prior traction or closed reduction attempts and are irreducible or unstable under general anaesthesia.

Spontaneous reduction with Pavlik harness in children younger than 6 and stable reduction under general anaesthesia in children younger than 18 months are not accepted as a surgical indication and treated nonoperatively.

Surgical procedure

A 5 centimeters long longitudinal incision is performed starting from the insertion of adductor longus with the patient supine and the hip in flexion and abduction under general anaesthesia. Adductor longus is released from its insertion. A blunt finger dissection is carried out to the femur with the adductor brevis is in anterior and gracilis and adductor magnus in posterior. Lesser trochanter is palpated with the rotation of femur. The elavetors are placed anterior and posterior to femur and the iliopsoas tendon is identified. Finger dissection to this point is very critical for the sake of vessels and obturator nerve.

When iliopsoas tendon is released it is spontaneously retracted and the joint capsule comes to

view. Fatty tissue over the capsule is detracted and the branch of medial circumflex artery is found at the acetabular site of capsule. This artery is mobilized towards acetabulum and the remaining is capsule alone in the surgical field. Despite the reports that ligation of this artery did not cause avascular necrosis⁸ we did not sacrifice this artery in any case.

Then, arthrography is performed. If the arthrographic reduction is Tonnis^[16] grade I, then the subcutaneous tissue and skin is closed and a bilateral hip spica cast with the hips in 60-70 degrees abduction is applied. The cast is lengthened to the middle of the calf and both feet are left free (Figure 1).

If the arthrographic reduction is Tonnis grade II or III (Figure 2a-c), then the joint capsule is incised and released. Initially capsule is incised longitudinally along the femur and then a transverse incision to anterior and posterior is performed. Ligamentum teres is resected first from the femoral head and later from the acetabulum. Holding the capsule from the edges with fine hooks, inferior capsule is released through interior joint space upto the acetabulum including the ligamentum transversum acetabuli. At this point it can be seen that the reduction of the femoral head is very easy and the safe zone becomes wider. Limbus had not been resected in any case. Following inferomedial release, limbus had never been an obstacle for reduction. Inverted limbus in arthrographies had easily been everted by the reduced femoral head. Pulvinar had not been resected in the surgery in any case. Treatment after this point is continued as it is in Tonnis grade I reduction.

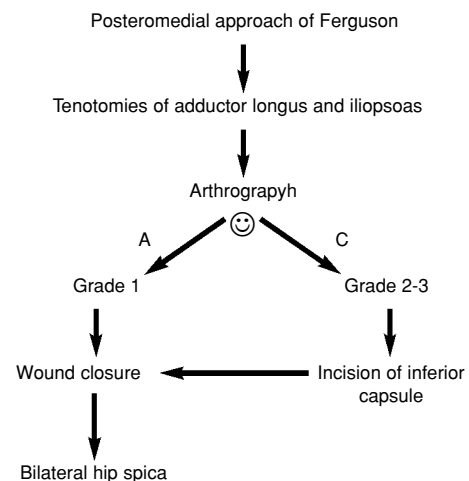


Figure 1. Our new algorithm in open reduction through medial approach

X-rays are taken prior and following cast application. Patients are generally discharged in the day after surgery. A control x-ray is obtained on first month following surgery. The cast is removed on the third month, an abduction device which holds the hips in the same position as the cast does is applied and an x-ray is obtained. This abduction device allows knee motion. A control x-ray is obtained on the sixth month and the device is continued only at nights and sleeping hours for an additional three months. Patients are followed up with clinical examination and x-rays every three months in the postoperative first year, every six months in the postoperative second year, every year in the postoperative third and fourth years and then every two to three years until maturity.

Medial approach and avascular necrosis

Avascular necrosis following open reduction through medial approach is reported to be in a variety of 0 to 67%.^[1-14,17,18] But when these reports are investigated, it is seen that there is not a uniformity regarding age, number of patients, preoperative traction or other treatments, surgical technique, cast position and follow-up method and duration. In an example to express the variety of follow-up dura-

tion, in the first report of one of the authors (YT), 56 hips of 37 patients were followed for a mean of 8.1 (3-17) years and the rate of AVN was reported to be 8.9%.^[11] Ten years later, same patients were called for another control and 44 hips of 30 patients could be examined. The mean follow-up for these patients was 19.8 (13-27.5) years. As type II AVNs which are detected in preadolescent period were also included, rate of AVN is found to be 20% in the second study. AVN assessment was done according to Kalamchi and MacEwen²¹ method in both studies. AVN rates are different in same authors' same patients with same assessment method but different follow-up duration. Besides the results of 12 hips of 7 patients are not known due to loss of follow-up.

The only common point of the previously series in the literature about the medial approach for DDH is that the incisions were at the medial side of the hip. So, a comparison can not be made. Assessment of the incidence of AVN can only be done at the maturity.

Relation between Ossific Nucleus and AVN

With an assumption that the arterioles are within cartilage canals in an unossified femoral head and prone to injury when compared to ossified femoral head, some authors^[22] reported a higher incidence of

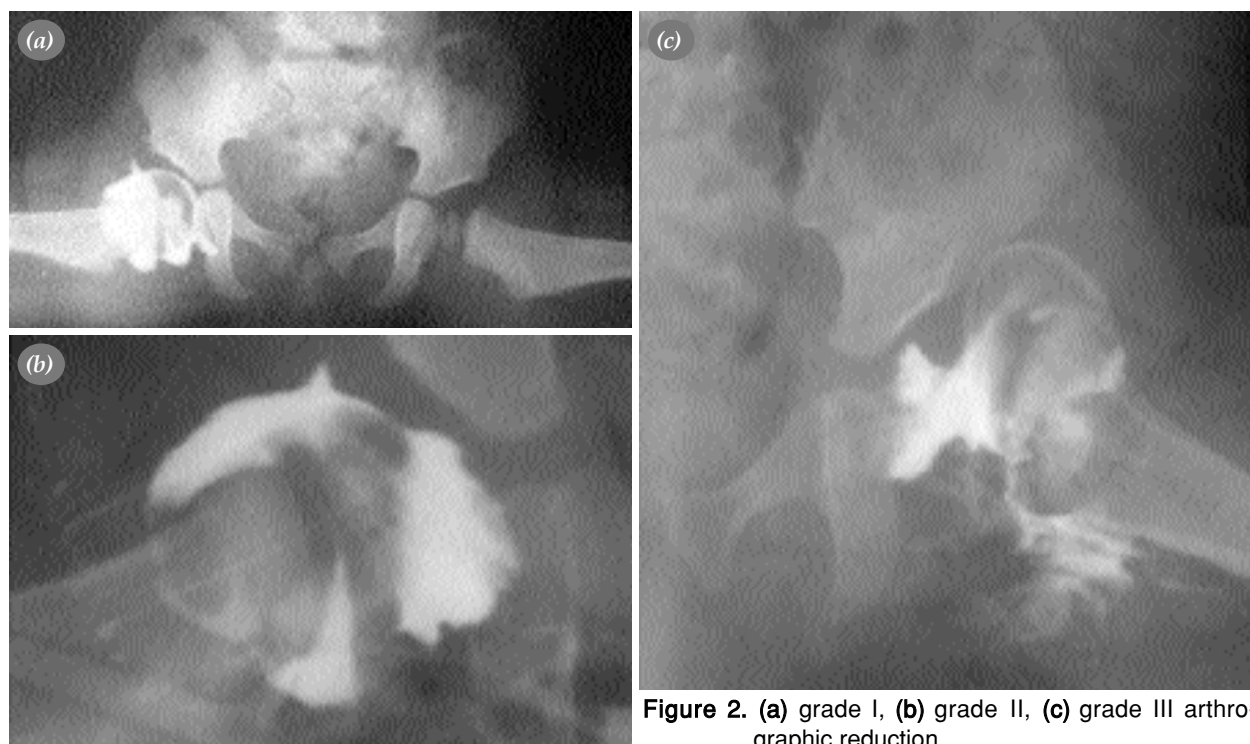


Figure 2. (a) grade I, (b) grade II, (c) grade III arthrographic reduction.

AVN in cases with unossified epiphyses while some others^[23] did not find any difference.

Also with the same reasons, some authors recommend delaying surgery until the ossification of epiphysis^[24] while some authors advocate that this delay results with two times higher incidence of AVN and recommends early surgery.^[25]

We investigated the risk factors for AVN in our cases.^[26] what we found out was that the ossification of epiphysis was not related neither to AVN incidence nor to severity of AVN.

Relation between patient age and AVN

It was reported that AVN incidence is related to older age^[8] and some authors^[6] did recommend not to perform open reduction through medial approach after 12 months of age. In both of our studies,^[26,27] a correlation between age and AVN incidence did not exist with medial approach in patients under 18 months of age.

Inadequate soft tissue release is an important factor as harmful surgical technique and extreme abduction are in AVN development.

Some authors believe that in the presence of a stable reduction, the remaining soft tissues between the acetabulum and the femoral head are expected to disappear by time. Believing to that idea, in our another series^[17], we did not open the capsules in arthrographic Tonnis grade II reductions following the adductor and the iliopsoas tenotomies in 32 hips of 21 patients. We observed 42% AVN, 19% redislocation and we needed to do 29% secondary procedures. These were the highest rates of complications we have ever had, so the capsule is opened and relaxed in all grade II arthrographic reductions in our new algorithm.

Relation between patient age and need for secondary procedures

It was reported that the need for secondary procedures following open reduction with medial approach increases as the age of the child gets older^{6,25}, and for this reason it was recommended that this type of treatment should be performed under the age of one⁶. Depending on this idea, some authors suggest combined acetabular osteotomies with open reduction in children under the age of 18 months.^[28,29]

In one of our studies,^[27] secondary procedures in children who were operated between the ages of 12 and 18 months, were found to be significantly higher when compared to children who were operated under the age of 12 months. Because of the lack of knowledge about the potential of spontaneous development of acetabulum, two decades ago we used to perform secondary bony procedures without waiting for the spontaneous healing of acetabular displasies. But nowadays we can observe that many of the remaining acetabular displasies are healing spontaneously. Because of this, our secondary procedure rate in our new study' first report is only 2%.

The most controversial age group of hip dysplasia is between 15 and 18 months. In this age group we achieved 83% successful result with open reduction through medial approach without any bony procedures. The follow-up was minimum of 5 years. Unsuccessful results were related with male gender, high dislocations and an acetabular angle of more than 45 degrees.

We performed a study to evaluate the potential for the healing of acetabular dysplasia following the reduction of the hip.^[31] The unilateral cases who were treated with open reduction through medial approach and did not experience any problems were followed up to a minimum age of 10 years and acetabular development in both operated and non-operated hips were assessed (Figure 3). The most rapid acetabular development on operated hips was in the

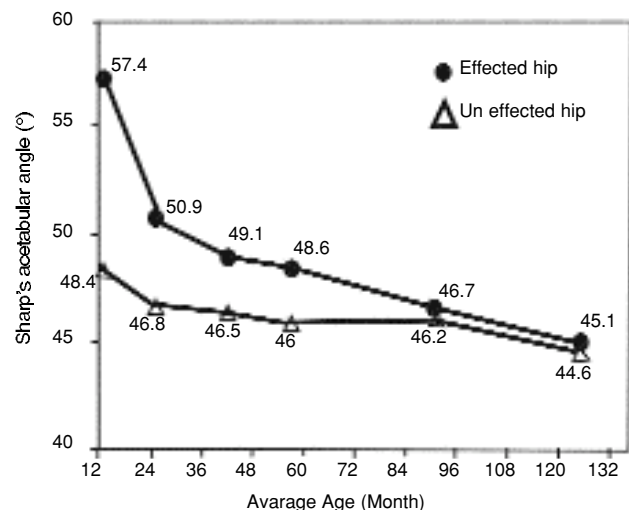


Figure 3. Comparison of acetabular developments in operated and non-operated hips in unilateral hip dysplasia.

first year following operation. The development continued and reached to contralateral nonoperated side values in a mean of 7 years of age. After this age both acetabulae continued to develop until the age of ten years of age. As a conclusion of this study we can say that it is not true to judge about a permanent acetabular dysplasia before the age of 7 years in a hip which was treated with open reduction without any problems. As this study was ended at the age of ten years we can say that acetabulae continue to develop until the age of 10. What we hope to prove with this study is that, acetabular dysplasia continue to heal as long as the primary and secondary ossification centers are open if there is congruent reduction without AVN. We suggest not to perform any secondary bony procedures and wait for spontaneous development as far as the femoral head is congruent to acetabulum with full function without any restriction. There are few studies investigating the effect of iliopsoas tenotomy in long term follow-up. In the previous two studies^[6], 25 gait was found to be normal despite reduction of iliopsoas muscle power. We, too, did not detect any difference in gait analysis of unilateral cases regarding the operated and nonoperated sides.^[33]

Radiological assesement

Radiological assesemants are mostly done according to Severin classification.^[34] But studies report that this classification system is not reliable because all the data except CE angle are subjective^[35] and the femoral part of the joint is neglected. For an example a spheric femoral head with a severe coxa breva as a result of type III AVN can be graded as grade I according to Severin classification. We suggested an objective radiologic classification depending on fully objective data.^[36] We believe that radiologic assesement shoul also be done following maturity.

As a conclusion, open reduction through postero-medial approach is a simple and safe method without a need for blood transfusion in even bilateral cases of hip dysplasias under the age of 18 months.

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