ORIGINAL ARTICLE

Outcome of one Stage Surgical Correction of Developmental Dysplasia of Hip (DDH) in Children Older than three years of age

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ABSTRACT

Aim: To study the outcome of one stage correction of developmental dysplasia of hip (DDH) in children older than three years of age

Methods: This prospective study was carried out at Orthopaedic and spine unit of Hayatabad Medical complex, Peshawar from July 2007 to December 2014. With non-probability consecutive sampling technique, a total of 28 hips with DDH in 22 children of age more than 3 years (03-08) were included in the study. All the patients were managed with primary one-stage triple procedure including open reduction of the hip joint, pelvic and femoral osteotomy and were followed for a minimum of one year. Modified McKay's criteria was used for the clinical evaluation. The degree of dislocation of the femoral head was assessed by Tonnis classification system. Severin's grading system was used for Radiographic evaluation, Salter classification system was used for assessment of avascular necrosis.

Results: A total of 22 patients (28 hips) were operated for developmental dysplasia of the hip. The mean age of the patients at the time of ward admission was 4.4 years. The mean follow-up period was 23 months. The average acetabular index pre operatively was 42 degrees and it to 28 degrees post-operatively. According to Modified Mackay's scoring system system 14 (50%) Hips were excellent (stable hips with pain free full range of motion, no limp and negative trendeleburg sign), 09(32%) hips were good, 03(11%) hips were fair and 02 (07%) hips were poor.

Conclusion: One stage, triple procedure of open reduction, femoral shortening and Salter osteotomy is a very safe and effective method for the treatment of DDH in older children.

Keywords: Developmental dysplasia of hip, Older children, One stage surgical correction

INTRODUCTION

Developmental dysplasia of the hip (DDH) is a congenital disorder which is very common, the overall incidence is approximately 3 to 4 per 1000 live births.[1] Screening programs for early detection of developmental dysplasia of the hip have been implemented in many countries; however it is not uncommon to see a child with neglected developmental dysplasia of the hip DDH especially in developing countries where screening for DDH is not common.[2] Early detection of DDH is rare due to lack of screening programmes, home deliveries and lack of resources and infrastructure, poor means of transport, availability of orthopedic doctor who may screen child for DDH and lack of awareness in pediatricians and general physicians not to mention the awareness level in parents. Dysplastic hip is usually discovered by limping gait when the child starts walking. Those children who present before three years of age have a more favorable outcome for such a condition[3,4]. Treatment for such patients with DDH is close reduction (if age is below 18 months) or open reduction (children over 18 months) and stabilization of the joint in reduced position to restore physiological joint development. Closed reduction is preceded by Arthrography, to confirm the reduction and find out the stability of reduction. The main objective in the management of DDH patients is to provide a concentric and reduced hip joint which in turn will stimulate normal development of femoral head and acetabulum and ultimately a normal hip joint at adulthood[5,6]. Although closed reduction has been recommended as the first-line treatment modality, large proportion of such patients requires secondary surgery for residual dysplasia[7]. The reason is late presentation of such patients because remodeling potential of hip joint is significantly decreased with late presentation. Children older than three years usually require open reduction combined with pelvic and femoral osteotomy[8,9]. Many different surgical procedures have been performed and are present in the literature for the treatment of DDH.[10,11] Pelvic osteotomy reorient the pelvis and enhances femoral head coverage, which stabilizes the femoral head inside the acetabulum. Femoral shortening facilitates reduction and reduces chances of avasular necrosis and redislocation of femoral head[12]. Femoral osteotomy provides the advantage of derotation and

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varus component along with shortening whenever required. Along with the bony procedures extensive soft tissue releases (especially adductor longus and psoas tendons) and capsulorrhaphy is required to facilitate the reduction hence reducing post operative complications. One-stage triple procedure consisting of open reduction, pelvic osteotomy, and femoral osteotomy has been the preferred procedure for neglected DDH patients. Triple procedure used for older children has shown excellent results in various studies.[13,14] This procedure requires proper pre operative evaluation and planning for better outcome and is technically demanding in older children. The aim of this study is to evaluate the functional and radiological outcome of one stage triple procedure in children older than three years with DDH.

PATIENTS AND METHODS

This prospective study was conducted at Department of Orthopedic and spine Surgery hayatabad Medical Complex Peshawar (HMC) from July 2007 to December 2014. A total of 28 hips with DDH in 22 children of age more than 3 years (age range 03-08 years) were included in the study. Children with age less than three years, paralytic, pathological, teratologic or traumatic dislocations were excluded from the study. All patients were followed for a minimum of one year. Clinical data of all the patients like pain symptoms, range of hip joint motion, status of Trendelenburg sign and gait pattern were recorded for all the patients both pre-operatively and post operatively at the last follow-up visit. Modified McKay's criteria was used for the clinical evaluation[15]. The degree of dislocation of the femoral head was assessed by Tonnis classification system[16]. Severin's grading system was used for radiographic evaluations.[17,18] Salter classification system was used for assessment of avascular necrosis[19]. All the patients were managed with primary one-stage triple procedure including open reduction of the hip joint, pelvic and femoral osteotomy. After cleaning and drapping the surgical site adductor tenotomy was done through a small separate incision. Somerville approach through Bikini incision was then used for hip joint exposure; psoas tendon was released first followed by exposure of the hip joint capsule from all sides. Capsulotomy was performed followed by excision of pulvinar, release of ligamentum teres, and division of transverse acetabular ligament. A separate mid-lateral straight incision was made for femoral shortening at the sub trochanteric region. Femoral osteotomy was done first and then followed by open reduction of the involved hip. The overlap in the proximal and distal fragments of femur was calculated and resected approximately 1 to 3 cm of resection was done in our series. A derotation and/or varus component was added to the femoral osteotomy. Femoral osteotomy was fixed with four-hole small fragment DCP. Gigli saw was used for pelvic osteotomy. Two K-wires of appropriate size were used for Fixation of pelvic osteotomy. The redundant capsule was excised and capsulorrhaphy performed in all cases. Post-operatively, the hips were immobilized in one and half hip spica for a total of 12 weeks, once changed at 6 weeks under general anesthesia along with the removal of stitches and K-wires. In bilateral DDH cases, second hip was operated in the same setting. After the removal of cast at 3 months the hips were mobilized progressively under the guidance of a physiotherapist. Progressive walking and gradual range of motion exercises were advised. DCP used for fixation of femoral shortning and derotation was removed after 12 months. All patients were evaluated after minimum of 12 months.

RESULTS

A total of 22 patients (28 hips) were operated for developmental dysplasia of the hip. Six (27%) were males while 16(73%) were females. Six (27%) patients had bilateral and 16(73%) had unilateral involvement. 07(32%) patients had right side and 09(41%) had left side hip involved. The mean age of the patients at the time of ward admission was 4.4 years (Range 03-07 years). The mean follow-up period was 23 months. We used Tonnis classification system for grading the degree of dislocation. Pre-operatively 3 hips (11%) were in Grade 1, 12(43%) in Grade 2 and 13(46%) in Grade 3. The average acetabular index pre operatively was 42 degrees and it to 28 degrees post-operatively.

Severin's criteria was used for the assessment of post operative radiographic results after the treatment of developmental dysplasia of hip. 16(57%) hips were Severin grade V pre operatively and 12(43%) graded as Severin grade IV. Post-operatively there was no patient with Severin grade V, 04(14%) were Severin grade IV, 04 (14%) were Severin grade III, 6(21%) were Severin grade II and 14 (50%) were Severin grade I. Modified Mackay's scoring system was used for post operative clinical outcome. According to this system clinical outcome of 14(50%) hips were excellent (stable hips with pain free full range of motion, no limp and negative trendeleburg sign), 09(32%) hips were good, 03(11%) hips were fair and 02(07%) hips were poor. One 4 years old female patient developed posterior hip dislocation post operatively; most probable cause of this complication was excessive internal derotation component of the femoral osteotomy. She was

admitted for revision surgery, a 3D CT-scan was done to evaluate the hip joint. Open reduction of the hip was revised along with correction of femoral derotation. At the last follow up (14 months) the patient was stable with no active complaints. According to Modified Mackay's scoring system the hip score was good i.e. very mild painless limp. Another 5 years old female patient with bilateral DDH at 4 months follow up had excellent clinical results as she was walking without a limp with no pain and her hips were stable but later both her hips were showing early signs of avascular necrosis (AVN). In our series post operative limb length discrepancy (LLD) was not more than one cm except in one case in which discrepancy was 2.5 cm initially; patient was given a shoe lift. This discrepancy decreased with the passage of time.

DISCUSSION

Timely diagnosis and treatment of DDH is something which an Orthopedic surgeon would like the most. On the contrary delayed treatment due to late presentation can be a nightmare both for clinician and parents/patients[4,6,7,8]. Age at the start of treatment has an established role to play in the ultimate outcome.

In this study patients were operated upon and were followed up with an obvious advantage as compared to retrospective analysis of medical records which might not be entirely reliable. But there were some short comings like patients were operated upon by different surgeons who were at different stages of their learning curve, experience and each surgeon had his own technique. There can be a great deal of variations in measuring the Limb length discrepancy. Follow up was not lengthy enough to know the long term sequelae of surgery like secondary hip dysplasia, osteoarthritis etc.

In children over 3 years of age, only open reduction is not enough. It should be augmented with osteotomy of the acetabulum and/or femur[7,20]. The exact procedure at any age cannot be properly defined. One-stage approach to dysplastic hip in late-diagnosed DDH is reasonable; especially if under taken before 8 years when there is potential for growth and remodeling of acetabulum[4,8,15].

Many authors would recommend surgery for delayed presented DDH with a note of caution[15,16]. Most studies include several modalities of treatment, and it is difficult to analyze the influence of a specific factor or treatment.[9]

Ryan et al[17] reported on 18 children (25 hips) with previously untreated DDH who had a one-stage combined operation between the ages of 3 and 10 years. The authors recommended the procedure, which can result in remodeling of the acetabulum and the formation of a functional hip, for patients from 3 to 10 years of age.

Karakaş et al[15] reported the results of one-stage combined operations in 47 children (55 hips) who were at least 4 years old. Forty-seven hips had been managed with preoperative traction. They obtained 67% clinically and 65% radiographically good or excellent results according to McKay and Severin criteria an average of 7.5 years after surgery.

Ganger et al[8] reviewed 42 patients (54 hips) in which 18 hips were treated with open reduction and 36 hips were treated with one-stage combined procedures. The mean patient age at the time of surgery was 4 years. After a mean followup of 3.5 years, 43 hips (80%) were classified as good or excellent results according to Severin classification. Our study had 14 hips out of 28 total (50%) excellent score post operative while 9 hips were deemed as good (32%). 3 hips were considered fair and 2 hips did poorly.

Forlin et al[6] had almost the same findings in his review of 24 hips of 20 patients treated after the age of 4 years (range, 4-12 years), his followup was 5 years longer than ours. Seventy percent of the hips had excellent or good results according to McKay and Severin criteria. They reported worse outcomes in patients older than 7 years at the time of surgery.

In our series, a single patient had recurrent dislocation. Previous studies show the rate of recurrent dislocation to be 0-8 % depending upon the approach, technique, component and type of surgery[7] (what was the age, was there bilaterality in this patient, I mean surgeon doing two hips in same setting would get fatigue and less attentive to surgical technique, what was post operative acetabular index, did he or she removed the spica early on and weight bear?)

Out of many complications AVN or ON (osteonecrosis) is the most dreadfull[14]. One patient (2 hips) in our study who had bilateral DDH, treated with a one-stage combined operation at age five years. The reason for the AVN in this case could not be identified, but bilateral cases have a poor outcome.[21] This ratio is similar as compared to previous studies but those studies like that of Ryan et al[17] included patient more than seven years and osteonecrosis is especially more in that age group. Three of 15 hips younger than 7 years old suffered AVN, whereas this ratio increased to 70% in 5 patients (10 hips) older than 7 years old. Although the prevalence of AVN was relatively low in our study (two out of 28), which is in sharp contrast to previous studies.[6,15,17]. So what is the reason of these good results regarding osteonecrosis? how was this patient managed? what was the stage of osteonecrosis? Answers to these questions need further research and a larger sample size.

CONCLUSION

Based on our experience we recommend the one stage, triple procedure of open reduction, femoral shortening and Salter osteotomy for the treatment of DDH in older children.

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