Developmental Dysplasia Of The Hip At Five Years Of Age Treated With Open Reduction And Femoral Osteotomy: A Case Report

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INTRODUCTION

Normal hip development depends on proportionate growth of the acetabular triradiate cartilages and the presence of a concentrically located femoral head. Various genetic factors, hormonal factors, intrauterine mal-positioning and postnatal factors play a role in etiology of the developmental dysplasia of the hip (DDH). A child may be born with acetabular dysplasia without dislocation of the hip, and the latter may develop weeks or months later.

Westin et al. reported the late development of dislocation of the hip in children with normal neonatal clinical and radiographic examinations; they termed this developmental dysplasia as opposed to congenital dysplasia of the hip. Diagnosis based on clinical suspicion that is limitation of abduction, asymmetrical skin folds, positive Galeazzi sign, waddling or Trendelenburg gait and followed by radiographs taken in anteroposterior (AP) view and lateral view (frog leg position). In AP view approximate position of cartilaginous head is ascertained by following the ossified femoral neck. Lateral view gives idea regarding the anteverision of the neck. DDH when diagnosed at birth and treated at earliest results in normal development of the hip without any surgical intervention, but for delayed presentation surgery is required. Treatment options start with conservative treatment to keep the head within the acetabulum for plastic modulation in position of abduction and flexion. If detection is late various surgical options available are reduction of the head with femoral or innominate or acetabular surgeries. There is no doubt that open reduction and femoral shortening with capsulorraphy can relocate the head but there is always the scope of reorientation of the acetabulum to improve head coverage and acetabular index1, 2, 3. Salter and Pemberton osteotomy are the commonly done procedures on pelvic side2, 3. The present case report details the usage of the Pemberton osteotomy in 3 cases of developmental dysplasia of the hip who presented late. When treated with Pemberton osteotomy they resulted in a good reduction of the acetabular head.

CASE REPORT

3 females (2.5, 3, and 3.5 year old) presented to our institution with a limp of the affected side. After history, clinical examination and necessary investigation, they were diagnosed having developmental dysplasia of the hip with the head either subluxated or dislocated and with a high riding head. [Figure-1] The patients were taken up for surgical reduction and Pemberton type osteotomy was done in each one.

In all the 3 cases reduction of the femoral head was done through anterior approach through bikini incision. After
incision along the iliac crest, sub-perisoteal dissection of the gluteal muscle followed by retraction the rectus femoris, the capsule was opened. Femoral shortening in the sub-trochantric region was done through another incision and reduction of the femoral head into the acetabulum was done. A femur bone segment equal to overlapping of fragments was removed and fixation of femoral fragments with plating was done and graft removed from pelvic osteotomy was put at the shortening site. Then a Pemberton osteotomy was done which was started at AIIS and then proceed posteriorly and inferiorly to enter the tri-radiate cartilage. This was done with curved osteotome under C-ARM guidance. Osteotomy was first done on an outer table as it is a semicircle and it ends at the posterior aspect of the tri-radiate cartilage, then the osteotomy was completed at the inner table either at the same level or inferiorly depending on whether coverage was required superiorly or anteriorly. Then the osteotomy was opened and fixed with bonegraft removed from the femur. No internal fixation was required. The patient was put in one and half spica for 3 weeks, followed by abduction cast for the next 3 weeks. A single cut CT scan was taken post-operatively to confirm reduction, Weight bearing was started after 2 months. The patient was followed up with serial radiographs which showed reduced head within the acetabulum. [Figure-2 & 3] No residual defect or any obvious complication or complaint was recorded.

**Figure 1**
X-ray showing a dislocated hip on the left side with the femoral head above the acetabulum, making a pseudo acetabulum.

**Figure 2**
X-ray showing the femoral head within the acetabulum after femoral shortening and Pemberton osteotomy.

**Figure 3**
X-ray showing the femoral head within the acetabulum after 2 months.

**DISCUSSION**
Normal acetabular development depends on a normally placed femoral head. Reduction should be gentle and the joint should not be placed under strain. Some time closed reduction can be done but maintenance of the reduction without strain is not possible. If reduced under strain it can lead to necrosis of the head or dislocation occurs again specially during movement of extension and external rotation of the hip. At higher age closed reduction is not possible at all. Nomay et al presumed that after open reduction of the hip, the acetabulum which is shallow will remodel around the femoral head in response to pressure exerted by the femoral head. Usually this results in gradual deepening of the
acacetabulum and improved coverage of the femoral head. But
many times this remodeling is incomplete and the
acetabulum remains shallow and the roof remains inclined.
Kim et al found that patients between 4-5 years of age, an
acetabular widening was predictive of failure of acetabular
development and these findings represented an indication for
acetabular reconstructive procedures 6.
Salter and Pemberton are two recommended osteotomies to
reposition the acetabulum after correct reduction in age
groups younger than 8 years 7, 8. Salter osteotomy redirect
the acetabulum while Pemberton reshapes the acetabulum.
Pemberton osteotomy repositions the acetabulum to improve
anterior and lateral head coverage 9. Osteotomy begins at
AIIS and proceeds inferior and posterior to enter the tri-
radiate cartilage 10.
The osteotomy hinges around the tri-radiate cartilage which
decreases the volume of the acetabulum and is especially
recommended for wide acetabulum and when more than 15
degree change in the acetabular index is required 9.
Osteoarthritis of the hip following operative treatment of
DDH directly depend upon pressure exerted on the head by
the acetabulum. If there is a wide zone of contact between
the head and the acetabulum, there is better distribution of
stress, but if the contact is minimal after reduction, point
pressure across the acetabulum and the head will lead to
early damage of the cartilage. So widening of the
acetabulum is never a desirable situation.
Salter osteotomy does not improve widening of the
acetabulum and there is modest improvement in the
acetabular index. Salter osteotomy needs internal fixation
therefore the child needs another procedure, though minor,
to remove k wire 11.
Pemberton osteotomy can achieve better improvement in the
acetabular index, decreases the volume of the acetabulum
and does not need internal fixation. Complications have been
reported with this procedure like premature closure of the
tri-radiate cartilage and growth disturbance 9, 12. These
complications can be prevented by not passing the
osteotomy through the tri-radiate cartilage.

LIMITATIONS
There are several limitations of this study like a small
number of cases and a limited follow up of 5 years. Despite
limitations of this study, we recommend this osteotomy,
though long term follows up and a large number of cases is
required for making strong recommendation.

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