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Original article

Outcomes of modified Dega acetabuloplasty in acetabular dysplasia related to developmental dislocation of the hip

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ABSTRACT

Developmental dislocation of the hip (DDH) is frequently, even after reduction, associated with residual acetabular dysplasia. Various surgical techniques are used to correct this, one of which is Dega acetabuloplasty. This osteotomy technique has, however, rarely been assessed in this particular indication. The present study therefore sought to describe the technical details, report clinical and radiological results, and present limitations.

Hypothesis: Unlike reorientation osteotomy in children, Dega acetabuloplasty does not lead to a high rate of acetabular retroversion at the end of growth.

Patients and methods: Sixteen Dega acetabuloplasties in 15 patients were assessed on joint range of motion, limp, lower limb length discrepancy and impaired everyday activity, pre-operatively and at end of follow-up. Hips were classified following Wicart et al. (2003). Radiologic assessment comprised Wiberg angle and acetabular index, pre- and post-operatively and at follow-up. Acetabular retroversion was analyzed by crossover sign, and hips were classified following Severin.

Results: Median age at surgery was 3 years (range, 1.1–12.2 years) and 10 years (6.4–17.8) at end of follow-up. At end of follow-up, all hips were pain-free and classified as Wicart A, and all activities were allowed. Radiologically, hips were classified as Severin I, II or IV, in 11 (68.5%), 4 (25%) and 1 (6.5%) cases respectively. Wiberg angle rose from a mean 3.3° (−30° to 30°) to 23° (10° to 38°) and acetabular index fell from a mean 31° (25° to 45°) to 20° (5° to 30°) with surgery, and both continued to improve over follow-up: 26° (12–45°) and 13° (3–24°) respectively ($P < 0.05$). Acetabular retroversion was found in 2 of the 10 hips with Y cartilage fusion.

Discussion: Modified Dega acetabuloplasty was effective in correcting acetabular dysplasia in DDH. Functional and radiological results were good, with a low rate of acetabular retroversion (2/10), unlike with other techniques.

Level of evidence: Level IV. Therapeutic study.

1. Introduction

Reducing developmental dislocation of the hip (DDH) enables acetabular growth and corrects acetabular dysplasia, which may however persist, constituting a negative long-term prognostic factor requiring surveillance throughout growth and in early adulthood [1]. Salter's innominate acetabular reorientation osteotomy is the most frequently performed procedure [1]. In 1964, Dega [2] described an incomplete transiliac osteotomy to correct acetabular dysplasia following DDH. Since then, few studies [3,4] have reported results for this procedure in this indication, and none have analyzed the evolution of acetabular retroversion following Dega acetabuloplasty. For more than 15 years, we have been using a modified Dega osteotomy [5] for acetabular dysplasia following DDH. The present study reports technical details and assesses results in terms of the evolution of acetabular parameters at more than 5 years' follow-up.

2. Patient and method

2.1. Patients

The series comprised children managed by modified Dega acetabuloplasty [5] for acetabular dysplasia following DDH and

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Table 1
Patients' data.

Hip No.	Previous treatment	Age at surgery (years)	Associated procedure	Age at FU (years)	Wiberg angle (°)			Acetabular index (°)			Severin	Acetabular retroversion
					Pre-op	Cast removal	FU	Pre-op	Cast removal	FU		
1	CR	3		11	16	22	25	30	25	20	I	NA
2	CR	4		14	28	36	21	28	18	18	I	Yes
3		3	SR	11	30	22	24	30	25	8	II	No
4	CR	3		8.5	−12	21	21	30	20	12	I	No
5		2	SR	8	20	22	22	34	20	20	I	NA
6	CR	2		6.5	10	18	18	33	20	17	II	NA
7	CR	2	FO	8	−10	38	30	30	23	15	I	NA
8	CR	6		16	12	18	26	30	23	10	II	No
9	CR	10	SR	16	15	35	26	25	5	5	I	No
10	CR	2		15	−20	23	45	40	19	3	I	Yes
11	CR	4		9	20	28	45	25	5	8	I	No
12	CR	2	SR FO	8	−20	10	24	28	28	15	II	NA
13	CR	3	SR FO	8	10	19	20	28	20	15	I	NA
14	CR	1	SR FO	11	−25	23	40	35	30	8	I	No
15		2	SR FO	9	−30	10	22	45	30	18	I	No
16		12	SR FO	18	10	24	12	40	24	24	IV	No

CR: conservative reduction (traction and hip spica cast); ST: surgical reduction; OF: femoral osteotomy; NA: non-assessable due to lack of bone maturity (no cartilage closure).

who had no previous history of pelvic osteotomy. Minimum follow-up was 5 years. Between 1990 and 2005, 29 underwent this procedure. Dega acetabuloplasty was indicated for acetabular insufficiency (acetabular index ≥25°) associated with an acetabulum with an ascending iliac part long enough to provide sufficient cover when lowered. Fourteen of these 29 children were excluded for insufficient follow-up (<5 years): these were foreign patients, operated on in our department but followed up in their home country. In all, 15 children (16 hips) were analyzed (Table 1). Eight of these 16 hips received acetabuloplasty to manage dysplasia after conservative reduction, including 1 with femoral osteotomy associated in the same step; the other 8 received 1-step acetabuloplasty and associated surgical reduction of the DDH, including 5 with femoral osteotomy associated in the same step, for severe pre-operative subluxation of the femoral head.

2.2. Surgical technique

Surgery systematically used the Dega procedure [2,5,6], under general anesthesia and radioscopic control, the patient supine on a standard table with the buttock on the operated side raised on a cushion. The whole limb was included in the surgical field. Femoral osteotomy, when planned, was via a lateral incision on the thigh. A Bikini skin approach allowed acetabuloplasty and, when required, surgical reduction of the hip. The skin incision was made 1 cm below the relief of the iliac crest, and curved upward through the space between the sartorius and tensor fasciae latae muscles. The iliac crest was exposed and an incision was made along the cartilage. The lateral side of the iliac crest was exposed subperiosteally up to the great sciatic notch. Pelvic osteotomy was performed under radioscopic control, with a curved osteotomy beginning about 15 mm above the edge of the acetabulum. The osteotomy line was oriented backward toward the triradiate cartilage, beginning facing the antero-inferior iliac spine. Only the lateral table of the iliac wing was involved by the osteotomy line, except in the most anterior and posterior parts, where 2 mm of the medial table of the sciatic notch was also sectioned to facilitate mobilization of the roof of the acetabulum. An approach on the medial side of the iliac wing was unnecessary. The acetabular roof was lowered using a Méary distractor and fixed by a corticocancellous bone graft harvested either from the iliac crest (1 or 2 grafts) or from the femur (1 corticocancellous disk). The graft was introduced in the posterior part of the osteotomy, to lower the posterior part of the acetabulum and correct posterior dysplasia, straddling the cortical part of the crest so as not to cause correction loss by subsiding into the cancellous bone. No osteosynthesis was performed. At end of surgery, an AP pelvic radiograph was taken to check the positioning of the femoral head and the normalization of Shenton's line. Post-operative immobilization was in a hip spica cast for 6 weeks; in associated surgical reductions of the hip, this was followed by 3 months' nocturnal abduction braces, progressively withdrawn.

2.3. Assessment

Clinical examination of the hip comprised measurement of range of motion (ROM: normal for flexion >120°, abduction 45–50°, adduction 30–40°, internal rotation 45°, external rotation 35° and extension 20–30°). Hips were classified by ROM, following Wicart et al. [7]: group A, flexion 120–140°; group B, flexion 90–120°; group C, flexion <90° or no internal rotation; and group D, angular deformity >20° regardless of degree of flexion. Limp, pain and restricted daily or leisure activity were noted at end of follow-up, by simple interview, as no validated scale exists for these parameters in children.

Pelvic X-ray systematically comprised AP views, supine, with lower limbs in slight internal rotation to point the patella vertically. Assessment was based on the Wiberg angle and acetabular index [8]. Acetabular retroversion was assessed from the crossover sign [9,10]. Views were taken pre-operatively, at 45 days (at cast removal) and at end of follow-up, when hips were also classified following Severin [11].

2.4. Statistics

Pre- and post-operative qualitative clinical assessment classified patients in the above-mentioned groups. Angular values were compared on non-parametric Kruskal-Wallis test (using StatView software: SAS, Cary, USA), with pre- and post-operative and end of follow-up values as 3 independent groups. The significance threshold was set at $P < 0.05$.

3. Results

Median age at surgery was 3 years (range, 1.1–12.2 years), and 10 years (6.4–17.8) at end of follow-up. Sex ratio (M/F) was 1/14. Pre-operatively, no patients showed pain or activity restriction. Patients with pre-operative dislocation of the hip ($n = 8$) limped and showed reduced abduction on the dislocated side pre-operatively.