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Research Article

Outcomes with Early Removal of Spica Cast, Following Open Reduction in Developmental Dysplastic Hips and Evaluation on New Functional Score System

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Abstract

Background: The purpose of this study is to elicit the outcomes of open reduction in developmental dysplastic hips, after a minimal duration of post-operative cast immobilization. The outcome measures included risk of re-subluxation, re-dislocation, stiffness and psycho-social impact with early mobilization.

Methodology: This prospective cohort study includes Idiopathic, Developmental Dysplastic of Hips, in walking age group with Tonnis stage III and IV height of dislocation. The dislocated hips were reduced with an open reduction, release of soft tissue obstacles and correction of the structural abnormalities, by additional femoral and pelvis osteotomies. The outcome was measured with reference to duration of immobilization in cast spica for 6 and 7 weeks, recovery from stiffness and psycho-social impact. The study duration included from January 2017 to December 2019 with minimum follow up duration of 1 year. The clinic-radiological assessment was made with a newly designed Bhatti's functional score system and Severin's radiological classification.

Results: The overall outcome is assessed by combination of Bhatti's Functional score and Severin's Radiological classification. The results with 6 and 7 weeks cast immobilization in 90 hips of 67 patients were found very encouraging. None of these patients developed re-subluxation during removal of spica cast and thereafter. Moreover, the patients achieved full range of motion very early, with a better mobility and weight bearing. The families were also found to have significantly better psychosocial impact of early cast removal.

Conclusion: The outcome of this study favors, post-operative spica cast immobilization for 6 weeks being the best practice to achieve satisfactory results without significant risk of complications. The new functional score system found a better indicator to assess patient's limitations and have significantly better psychosocial impact.

Keywords: *Developmental Dysplastic Hip; Duration Immobilization; Functional Score; Psycho-Social Impact*

Abbreviations

DDH: Developmental Dysplasia of Hip; AVN: Avascular Necrosis; S: Squat; P: Palthi; T: Tashahhud

Introduction

The goals of open reduction of Developmental Dysplastic Hip (DDH) in walking age children are: (1) Concentric, anatomic reduction of dislocated hip without significant tension, (2) to reorient the biomechanical relationship to provide a natural mutual growth stimulating effect of caput femoris to the acetabulum for a development of normal hip at the adulthood [1,2]. These goals can be achieved with

meticulous dissection, release of soft tissue obstacles and correction of structural dysplasia with additional acetabular osteotomies, while femoral derotation and shortening osteotomies are required as per age group, individual case pre-operative workup and Catterall's test of stability at open reduction [1-3]. The main objective is to achieve a good stability with a minimum risk of re-subluxation, re-dislocation, Avascular Necrosis (AVN) and premature physical arrest, to have a normal development of hip without significant degenerative disease at adulthood [2,4-6].

To maintain the concentric open reduction, an immobilization in spica cast is necessarily needed to allow soft tissue and osteotomies to heal. The preferred duration of immobilization used by many investigators till recent literature was 10 - 12 weeks [2,3,6-8]. However, prolonged duration of immobilization in cast has been referred unnecessary, that usually cause significant stiffness, pressure sores and psycho-social disturbance to the family. The current literature supports immobilization in cast for 6 - 8 weeks, followed by rehabilitative exercises to get early mobilization, reduce stiffness, recover full range of movement and weight bearing at the earliest [9-12].

This study was conducted to evaluate the result of early removal of spica cast after 6 and 7 weeks. The parameters included were the risk of re-subluxation, re-dislocation, duration of stiffness, weight bearing period and psychosocial impact. Other objective was to assess clinical results on a new functional scoring system that directly indicates patient's limitations after surgical relocation of hip.

The outcome of this study favors spica cast immobilization for 6 weeks being the best practice to achieve satisfactory results without significant risk of complications. The Bhatti's functional score system found a better indicator to assess patient limitations and have significantly better psychosocial impact.

Methodology

This prospective cohort study includes Idiopathic DDH, in walking age group with Tonnis stage III and IV dislocation [2,7] (Table 1). The patients of 1year to 12years were included irrespective of sex and side of involvement. The patients with neurogenic disorders, myodysplastic, dysplasia due to infantile septic hip and having postoperative follow-up duration less than 1-year were excluded from the study.

Total 67 patients with 90 hips, were operated during January 2017 to December 2018 and followed-up for next one year. Patients were registered with prior informed written consent taken from parents and study approval from Institutional Review Board. All the patients were operated by a single surgeon (Dr.A.Bhatti), at two centers, Neuromedical Cancer Care Institute and Dr. Ziauddin Hospital Clifton, Karachi), with assistance of the trainee registrars.

The patients were operated with prior general anaesthesia fitness protocol through an anterior approach with Ilio-femoral incision and Somerville technique, percutaneous adductor tenotomy for the open reduction, double bracing capsulorraphy, additional pelvic osteotomy and through a separate lateral midline incision for femoral derotation with or without shortening [7]. The one stage combination of pelvic and femoral osteotomies was made by an ala carte approach on individual case requirement following a pre-operative work-up plan and Catterall test of hip stability [2], performed at open reduction after osteosynthesis in case of femoral shortening. All bilateral hips were operated under one go and same setting. The details of procedures are given in table 2. The decision for Salter, Pemberton or Dega osteotomy was made in light of per per-operative Catterall test of stability, double acetabulum and supra-acetabular bone stock coverage [2].

Following an open reduction and aseptic dressing, the 63 patients were immobilized in a spica cast, in a weight bearing position [2] without flexion at hips, for the duration of 7, 6 and 4 weeks. The initial 37 patients operated during 2017 were immobilized for 7 weeks, 26 patients operated during 2018 were immobilized for 6 weeks and remaining 4 patients were immobilized for 4 weeks, followed by a

removable Craig splint for the next 2 - 3 weeks. These 4 patients were physically bulky and aged over 8 years. The same post-operative cast was used for total duration of immobilization. The post-operative wound inspection was made through a large window fortnightly, dressing refreshed and plaster reinforced. After removal of cast, parents were advised for rehabilitative exercises at home and weight bearing allowed initially with support after 10 - 12 weeks.

The Clinico-radiological evaluation was made after minimum post-operative duration of 1 year and thereafter till the last follow-up in December 2019. The Clinical assessment of patients was made on self-designed Bhatti's Functional Scoring System (Table 3a and 3b) and radiological assessment on Severin Classification [13] (Table 4).

The Bhatti's Functional Scoring system (Table 3a) demonstrates the functional activities accomplished and indicates disability if any exhibited by the patient. This score includes an assessment of child while performing daily accustomed sitting habits in Asian community. It is less time consuming, can be performed with a significant ease and can be recorded in video and photo as well, for the purpose of record and re-evaluation. The Bhatti's functional scoring system assess the patient's limitations in daily life three accustomed sitting habits. The patient is asked to sit in: (i) Squat (S), (ii) Palthi (P) (iii) Tashahhud (T). These sitting habits are defined in Oxford Dictionary [14] as Crouch sitting, Cross legged sitting or sitting in lotus pose and kneeling or sitting on buttocks with kneeling respectively. The children usually feel happy, not scared of doctor's and clinic atmosphere. Each sitting Habits are graded in I, II and III depending on limitations on sitting as referred in table 3b. These types are further grouped as excellent to poor (Table 3b). Patient's Score excellent (Figure 1a-1c) is indicated with combination of SI + PI +TI, good on combination when any one type of S, P or T is in Type II component. Fair when all types are in Type II and/or one of these have Type III component and Poor when all habits have Type III category.

Figure 1a: *Tashad position.*

Figure 1b: *Squat position.*

Figure 1c: *Palathi position.*

This study is based on hypothesis that "if all the structural and soft tissue obstacles are corrected with a good initial reduction and the soft tissue and osteotomies heals well within 4 and 6 weeks respectively then there would be the negligible chance of re-subluxation or dislocation on removal of cast after 6 weeks". Moreover, the early rehabilitative exercises relieve stiffness very early, promotes full weight bearing soon as allowed, and have a better psychosocial impact on patient and the families as well, compared to immobilization over 8 - 12 weeks. Secondly the clinical evaluation on our self-designed Bhatti's functional scoring system is easy to perform by the patient and indicates patient's limitation with accustomed siting habits.

Statistical data was analyzed by using SPSS version-23.

Results

Total 67 patients with 90 hips were included. The mean age of patients was 3.94 ± 2.80 years, majority 42 (62.68%) patients were in age group between 18 months to 8 years and 7 (10.44%) were in age range 8 - 12 years and remaining 13 (19.40%) in age of 1 year to 18 months (Table 3). There was a female predominance of 70.1%, more involvement of right side (37.4%) and 34.3% cases were of bilateral DDH.

The table 1 shows the severity of the hip dislocations according to Tonnis staging for height of dislocation. 63 patients were at Tonnis stage IV DDH, 10 (14.9%) of them in age range 1 year to 3 years had preoperative Microcaput (Salter's type I avascular necrosis) [15] i.e. non-visualized or tinny capital femoral epiphysis. Moreover 3 hips out of 3 bilateral DDH had one sided Tonnis stage II dislocation with an acetabular index over 35°.

Tonnis Classification	
III	2 (3.0%)
IV	48 (73.1%)
IV + Microcaput	10 (14.9%)
Left IV + Right Acetabular dysplasia Tonnis II	1 (1.5%)
Left IV + Right III	2 (3.0%)
Left-III, Right-VI	1 (1.5%)
RT IV, LT-acetabular dysplasia, Tonnis II	2 (3.0%)
Total	67 patients

Table 1: *Tonnis stage for the height dislocation.*

Table 2 indicates the details of surgical procedure performed. In majority 39 (58.20%) patients with age group of over 30 months, open reduction was facilitated with femoral shortening and derotation osteotomy. Open reduction and capsulorraphy without additional pelvic osteotomy were performed in 12 hips of 11 patients in age group 1year to 18 months including 1 patient with bilateral Tonnis III DDH. The pelvic osteotomy was performed in 46 patients between 18 months to 12 years. The Salter's pelvic osteotomy [7] in 29 hips (20 patients), Dega's acetabuloplasty [7] in 9 hips (7 patients) and Pemberton's acetabuloplasty [7,16] in 36 hips (24 patients) including 3 hips of bilateral DDH having Tonnis II stage dislocation with obtuse acetabulum.

Age Range	Open reduction + Capsulorraphy	Open Reduction + Pelvic Osteotomy	Open Reduction + Femoral Shortening + Pelvic Osteotomy	Open Reduction + Pelvic Osteotomy + Distal Derotation Osteotomy	Number of Patients/ hips
1 year - 18 months	11	0	0	2	13/16
18 months - 3 years	1	8	15	4	28/38
3 years - 8 years	0	1	17	1	19/28
8 years and 12 years	0	0	7	0	7/8
Total	N: 12 (17.91%)	N: 9 (13.43)	N: 39 (58.20%)	N: 7(10.44%)	67/90 (100%)

Table 2: *Procedures performed in various age groups.*

The mean duration of hip spica immobilization used was 7.01 ± 1.24 weeks. The mean follow-up duration after open reduction varied with various procedures. It was 15.67 ± 2.93 months with open reduction and capsulorraphy, 16.22 ± 3.56 months with additional pelvic osteotomy, 14.98 ± 5.49 months with pelvic osteotomy and femoral shortening and 16.00 ± 7.13 months with pelvic osteotomy and distal femoral de-rotational osteotomy ($p > 0.05$).

The table 3 shows the clinical evaluation scoring and outcome on Bhatti's functional scoring system, where majority 43 (64.17%) of the patients achieved satisfactory results with excellent and good score, 19 (28.35%) less than satisfactory with score fair and 4 (5.97%) poor results with $p > 0.0$ amongst the groups.

Sitting Habit	Type I	Type II	Type III
Squat (S)	Able to squat comfortably	Able to squat with heel raised, need support, feel discomfort	Unable to squat.
Palthi (P)	Able to make Palthi comfortably by touching knee to floor	Able to make Palthi with knee raised from floor for < 45°, needs support and feels discomfort.	Unable to make Palthi, knee raised from floor over 45°
Tashahhud (T)	Able to sit in tashahhud easily.	Difficult to sit in tashahhud on floor, feel discomfort. Easy on chair with leg dropped down	Unable sit in tashahhud on floor or Chair with leg dropped down

Table 3a: *Bhatti's functional score system.*

Bhatti functional scoring		Open Reduction (n = 12)	Pelvic Osteotomy (n = 9)	Pelvic Osteotomy + Femoral Shortening (n = 40)	Pelvic osteotomy + distal femoral de-rotational osteotomy (n = 6)	Total	P-value
Excellent	SI PI TI	7	6	22	5	40	0.569
Good	SI PII TI	1	0	2	0	3	
	SII PI TI	0	1	0	0	1	
Fair	SII PII TII	4	2	7	0	13	
	SII PIII TII	0	0	5	1	6	
Poor	SIII PIII TII	0	0	1	0	1	
	SIII PIII TIII	0	0	3	0	3	

Table 3b: *Clinical outcome on Bhatti's functional scoring.*

The radiological assessment on Severin classification (Table 4) indicates, 64 (95.52%) patients were excellent (class Ia and Ib), 2 (2.9%) were good (class IIa and IIb) and 1 (1.49%) hip of a bilateral DDH developed subluxation Type Ia. This patient was then immobilized for extended duration of 2 - 4 weeks in a Craig splint with an advice of active assisted exercises, out of splint every 3 - 4 hours. At the last follow-up the hip was found to have an acceptable containment (Tonnis II) with good expansion of caput femoris. The combination of Severin class I and II was considered having satisfactory results. Moreover, clinically both these classes (I and II) behaves good with functional score and mobility.

Severin Class	Open reduction + Capsulorraphy	Open Reduction + Pelvic Osteotomy	Open Reduction + Femoral Shortening + Pelvic Osteotomy	Open Reduction + Pelvic Osteotomy + Distal Derotation Osteotomy	Number patients and hips	
Ia, 1b	11	9	37	7	64 (85)	
IIa, 2b	-	-	1	1	2 (3)	
III	-	-	-	-	-	
IVa	-	-	1	-	1 (2)	
Ivb	-	-	-	-	-	
V	-	-	-	-	-	
VI	-	-	-	-	-	
Complications						
No Complication	**8**	**7**	**34**	**3**	**52 patients**	**P Value 0.069**
AVN (Salter's II)	3	1	3	1	8 hips	
AVN (Salter IV)	0	1	2	0	3 hips	
Subluxation (Severin's IVa)	0	0	1	0	1hip	
Wound Infection	0	0	2	1	3 hips	
Plaster sore on back	2	0	0	1	2 hips	
Fracture Shaft Femur	1		1		2	

Table 4: *Severin's radiological classification and post-operative complications.*

Overall clinic-radiological rating was scored as excellent to poor, by the combination of Bhatti's functional score and Severin's radiological class (Table 5). The outcomes with 6 - 7 weeks postoperative cast immobilization were found very encouraging. Only one of these patients developed re-subluxation on removal of spica cast and thereafter. All the patients except those who had developed AVN Salter's type IV (Table 5), achieved very early full range of motion, better mobility and full weight bearing without support within 3 - 5 months. The families were quite satisfied and had significantly better psychosocial impact with removal of cast 6 - 7 weeks.

At Minimum Follow-up of 1 year		Open Reduction (n = 12)	Pelvic Osteotomy (n = 9)	Pelvic Osteotomy + Femoral Shortening (n = 40)	Pelvic osteotomy + distal femoral de-rotational osteotomy (n = 6)	Total	P-value
Outcome	Excellent	2	3	5	2	12	
	Good	9	6	29	4	48	
	Fair	1	0	5	0	6	
	Poor	0	0	1	0	1	0.806

Table 5: *Overall Clinico-radiological rating.*

The table 5 represents complications at a minimum follow-up postoperative duration of 1 year. Only one patient [4 years aged) experience re-subluxation on one side of bilateral DDH operated under same setting, clinically behaved fair and radiologically IVa, was labeled poor on overall outcome. The initial reduction in this case was also not satisfactory on that side. 10 patients under 2 years of age had pre-operative Microcaput (Salter's AVN type I), 6 of them redeveloped caput femoris of good size, while 4 continued to have malformed femoral head (Salter's AVN Type II). Whereas, 2 patients in age group 4 years and 1 patient aged 2 years developed AVN (Salter's type IV). 3 patients had superficial wound infecting that settled well with antibiotics as per culture and sensitivity report and two other had pressure sores on back due to plaster. 2 patients had fracture shaft femur during mobilization exercises within 6 months postop, they healed well with plaster cast.

Discussion

To achieve the best functional results at adulthood, diagnosis and commencement of treatment in Developmental Dysplastic Hip needs to be started at the earliest, soon after birth [3,9]. The delayed commencement of treatment particularly after walking age leads to progressive development of soft tissue obstacles and structural dysplasia of hip with coxa valga anteversa and increasing acetabular index. This necessitates release of these soft tissue obstacles, correction of structural abnormalities, ease out tightness at open reduction with additional femoral shortening, based on individual case requirement. Despite achieving best concentric, anatomical open reduction the outcome varies with increasing age, particularly when open reduction is performed around the age of 5 - 8 years and thereafter [2,3,9].

Hence in walking age groups, where additional osteotomies are need for correcting structural dysplasia, the hips necessarily needed to be immobilized in a spica cast for a duration not yet on consensus. The duration of spica immobilization in recent past was for 10 - 12 weeks [2,7-8]. Whereas, current literature supports immobilization for 8 weeks and found no significant increase in ratio of re-subluxation or dislocation [11,12,17,18]. Emara., *et al*. [19] however, immobilized their patients in two groups. Group A immobilized for 4 weeks followed by an abduction brace, weaned off in next few months and group B for 12 weeks. They reported that clinico-radiological outcome was same in both groups, 4 weeks immobilization was safer and associated with less complications and patient parents were at more comfort than with 12 weeks of immobilization [19]. In this study we also found no difference in outcome on clinical as well as radiological assessment in our 37 patients immobilized for 7 weeks and 26 patients immobilized for 6 weeks as well as patients immobilized for 12 weeks, reported in our earlier publications [3,6,20]. We further found that major factor to prevent subluxation/re-dislocation is to achieve a good initial concentric reduction without tension [2-4,20]. One bilateral DDH patient in our study developed re-subluxation on one side, on detailed scrutiny we found that hip was not fitting well since the beginning, hence re-subluxated soon after removal of cast within 3 - 4 weeks. The patient's radiograph in internal rotation revealed a better containment, indicating an incomplete derotation femoral osteotomy as the cause of re-subluxation. The study thus supports other studies [2,4,21,22], to prevent re-subluxation and dislocation, a good initial concentric reduction is the only option. The good initial reduction requires: (i) Adequate correction of structural dysplasia, (ii) Meticulous cleaning of acetabulum (iii) Reduction without tension (iv) Adequate release of soft tissue obstacles, especially the severance of transverse acetabular ligament and not leaving back the tags of inferomedial capsule [2,4,21,22].

Following an advice of Zadeh [2], we also found, when all soft tissue and structural abnormalities are corrected at open reduction, the cast immobilization in weight bearing position is sufficient instead to immobilize hips in the position of flexion and internal rotation as advised by Vitale., *et al*. [12], Bulut [17], Clarke [18]. But we do agree to immobilize hips in internal rotation in patients younger than 2 years where only capsulorraphy was performed. Similar to other studies [2,9,10,12,19], we found 4 - 6 weeks duration of immobilization in position of weight bearing is sufficient. All except one (bilateral DDH) were stable at minimum follow-up duration of 1 year and thereafter. All the patients achieved early full range of motion and early weight bearing (initially with support) at 10 - 12 weeks. Similar to Bajuifer SJ [23] who reports no re-subluxation, we had only one (1.49%) re-subluxation following immobilization for 6 weeks. The other reports with a minimum re-subluxation rate between 4.5% - 5.5% with 6 weeks immobilization. Thus, our study supports hypothesis that the best practice is a shorter duration of post-operative immobilization i.e. 6 weeks. The children with shorter period of immobilization also

behave better with fast recovery from stiffness, early weight bearing and walking soon as allowed at 10 - 12 weeks. The family also feels more comfortable as having minimum chances of pressure sores and smelling cast soaked in urine etc. Hence, the parents and kids remain morally up and keep up good follow-up. All these factors positively conferred our questions in the hypothesis as true.

Regarding relationship of risk of AVN to the duration of postoperative immobilization, literature is silent. Variable ratios of AVN have been reported with short [4 weeks] to long duration [10 weeks] of immobilization and combination of osteotomies to open reduction. The range of AVN reported varied widely from 2.3% to 50% [2,4,10,17-19,23,24]. AVN in current study which include wide range of age group from 1 year to 12 years falls among above ratio i.e. 12.22% hips of 67 patients, including 3.33% (3/90) hips having developed Salter's type IV AVN at the last follow-up. Our ratio of AVN is similar to Emara's report [19] of 15% in 4 weeks immobilization and lower than Emara's 48% and Clarke's [18] 45% in 6 weeks immobilization. This wide variation in the incidence amongst various studies is being attributed to classification used and strictness with which the criteria were interpreted [24]. Similarly, the causation of AVN have also been attributed to involvement of multiple factors including age over 5 years, style of dissection, tight reduction, capsulorraphy, type of pelvic osteotomy and application of cast in an extreme position [2,5,7,19,25,26]. The major factor amongst these is age at open reduction that has been reported to have significant direct relationship to risk of AVN [2,7,9,15]. AVN have also been reported to appear later at adolescent growth spurt and it is one of the major factors for compromised development of acetabulum, gait abnormalities, leg length discrepancy and early joint disease [2,7,15,25]. We had Salter's type IV AVN in 3/90 (3.33%) hips, 2 patients were aged 4 years, one of them had bilateral DDH, developed AVN on one side, both these patients had extensive surgery with additional femoral shortening and pelvic osteotomy. While 3rd patient (unilateral DDH) aged 2 years, had previous closed reduction and spica cast maintained for 11 months before reporting to this surgery, she already had Salter's type I AVN, her open reduction with additional pelvic osteotomy was without tension and easy (Table 5). Other 4/90 (4.44%) hips had Salter's Type II AVN that was infact a sequalae of pre-operative Salter's Type I AVN (not yet visualized or tinny caput femoris), these all were in age below 24 months having only capsulorraphy and distal derotation femoral osteotomy (Table 5).

We made clinical evaluation of patients on self-designed Bhatti's functional scoring system that correctly depicts the limitations of patients in his accustomed sitting habits and mobility achieved. while squat and tashahhud sittings patient exhibits full range of hip flexion and absence of pain. Whereas, in making a Palthi at ease, full range of abduction and external rotation and 90^0 of flexion at hip is exhibited. A patient who is not able to make these sittings at ease or need a support (Table 3), he exhibits restriction in range of motions at hip in abduction, flexion and external rotation and some degree of pain as well. These parameters of functional assessment are not demonstratable with clinical evaluations in previous published literature of Severin's [13], McKay's [16], Harris [27], Ferguson and Howarth [5,20] etc. All these systems evaluate range of motion in lying positions with a cumbersome, time-consuming mathematical calculations and does not reflect patients' limitations in daily life activities for which parents remains worried the most. Whereas, Bhatti's functional scoring system has an advantage of being easy to carry out, no mathematical calculation, carried out by patient without personal contact by surgeon, no apprehension exhibited by patient, takes only 2 - 3 minutes and can be recorded in a snap or video for future analysis. With this functional scoring system majority 44/67 (65.67%) patients behave excellent to good, 19/67 (28.35%) behaved fair i.e. having moderate degree limitation in performing daily activities, 4 (5.97%) had poor outcome. These results are nearly comparable to clinical outcome reported by Bajuifer [23] and Abdullah [1] from Saudi Arabia and Egypt, evaluated on combined McKay and Harris hip score and McKay's scoring Respectively.

Overall outcome assessed with combination of Bhatti's functional score and Severin's radiological class (Table 5), early regain of mobility, and timely weight bearing and overall satisfaction of parents. The 7 out of 22 patients having functional score fair and poor, were labeled fair and poor on overall outcome despite having better Severin class IIa and IIb. These patients were operated after age 8 years, had significant limitation on sitting habits due to gross stiffness and hypoplastic hip as compared to younger age group. This fact substantiate the findings of published literature that as the age increases the outcome of open relocation of DDH become more compromised, due to decreasing remodeling capacity after 6 - 7 years age [2-3,7,9,25]. Few other studies remarked that an outcome is no better than the untreated clinical course with an open reduction late after 8 years [4,9,28].

Limitation of the Study

The limitations with this functional scoring system with reference to AVN is short duration of follow up and inability to check Trendelenburg, limp and endurance and interobserver assessment for the functional score system.

Conclusion

The outcome of this study favors post-operative spica cast immobilization for 6 weeks being the best practice to achieve satisfactory results without significant risk of complications. The new functional score system found a better indicator to assess patient limitations and have significantly better psychosocial impact.

Conflict of Interest

There was no conflict of interest among investigators, hospitals and others.

Ethics Approval

The study and its synopsis was approved by the hospital's Institutional review board prior to start the study.

Funding

No funding was required to perform the study

Patient Consent

All parents were taken in confidence and got written informed consent for surgery, inclusion in study and publication of patients photograph.

Availability of Data and Materials

Data provided in study has been originally collected by the authors of study.

Authors Contributions

All authors have equally contributed in collection of data, evaluation and manuscript writing.

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