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Functionality Against Odds: Lower Extremity Functional Scale and Children Health Assessment Questionnaire in Children with Bilateral Septic Sequelae of Hip

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Abstract

Purpose: We assessed the functional and radiological outcomes of children with sequelae of bilateral septic hips. Additionally, we attempted to determine the impact of radiological unstable hips on clinical functionality of the child.

Material and methods: The retrospective case series included 9 children minimum 2 years post infection. The functional outcomes were assessed using Lower Extremity Functional Scale (LEFS) and Children Health Assessment Questionnaire (CHAQ). Follow up hip radiographs were classified according to the Choi's classification. We labelled the patient as having instability if either hip had a Choi type >3A.

Results: The mean age at final follow-up was 7.6 years. Five patients had multiple joints affection. The mean LEFS score was 62.7 and CHAQ-DI 0.2. The mean LEFS values for radiological stable hips (n= 5 patients) was 66 ± 19.4 and 58.5 ± 15.3 for unstable hips (p=0.5487) while corresponding CHAQ-DI scores were 0.12 ± 0.13 and 0.27 ± 0.12 respectively (p=0.1098) indicating poor reliability between functional capabilities of the child and the radiological appearances of the hips. A strong negative correlation however existed between LEFS/ CHAQ-DI values (R= -0.897; p=0.001).

Conclusions: Septic hip sequelae in children leads to various degrees of functional limitations and patients with multiple joint involvement have worse outcomes. The hip radiological findings do not relate with the overall functional status of the child.

Keywords: Functional outcome, Disability, Hip, Sepsis, Child

Introduction

Musculoskeletal infections are important contributors to morbidity and mortality in pediatric age group [1]. Hip is the second commonest joint after knee to be affected by septic arthritis in children. The hip joint in childhood is more susceptible to infection and consequent injuries due to a number of factors. The intra-articular metaphysis, tenacious end artery blood supply, its weight-bearing responsibilities, the presence of multiple physal plates in the area and its deep intramuscular location disguising external indications of inflammation are some of the characteristics specific to the pediatric hip joint [2]. Due to improved nutrition, living conditions, and advanced diagnostics, the incidence of septic arthritis in children is gradually declining in high income countries [3]. However, septic arthritis still remains one of the most dreaded problems in the low-income countries, despite significant progress in health care facilities and therapeutic measures [4-6]. The global incidence of septic arthritis stands at 5 to 12 cases per 100,000 persons, and among neonates it is 0.12 per 1000 births. In India, it is seen in approximately 1 in 1500 births [7].

There is a paucity of literature in assessing long-term outcomes of septic hip sequelae in children [8-10]. The sequelae have been described mainly in radiological terms e.g.

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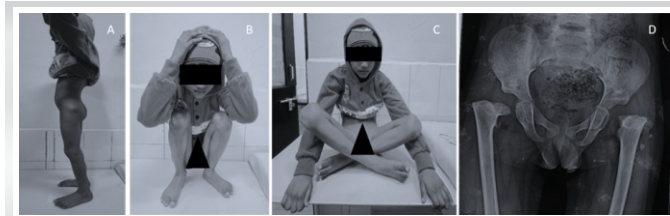


Figure 1: A, B, C. Clinical outcome in a 6-year-old child with bilateral hip involvement. The Choi radiological type was IIB on both sides (Figure D). The LEFS score was 70 and CHAQ-DI 0.11.

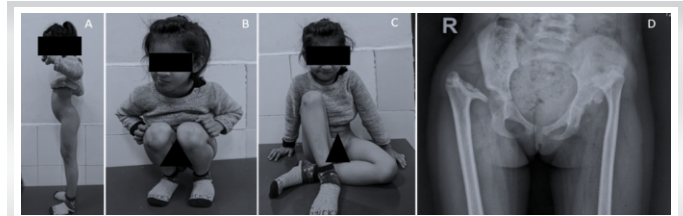


Figure 2: A,B,C. Clinical outcome in a 9 year-old child with right hip Choi type IVA and left hip Choi type IVB (Figure D). The LEFS score was 74 and CHAQ-DI 0.17 even in presence of 'unstable' hips on both sides.

Choi types and less in functional terms. Involvement of both hips by septic phenomenon is a rare occurrence and their functional or radiological assessment more challenging. In our knowledge, there is no literature reporting overall status of pediatric patients with bilateral septic hip sequelae. In this retrospective series, we assessed the functional and radiological outcomes of children with sequelae of bilateral septic hips. Additionally, we attempted to determine the impact of 'unstable' hips on the clinical functionality of the child.

Material and methods

Retrospective study was carried out at a tertiary care pediatric center located in the suburb of a low-income country. The study was part of a larger research investigating the sequelae of osteoarticular infections on the lower limbs in children. Ethical clearance was obtained for the research. A chart review of patients with septic sequelae of both hips was carried out from January 2008 to December 2022 and patients were called for follow up. Informed consent was taken from the included patients for publishing of radiographs and results.

Our inclusion criteria were children with sequelae of bilateral septic hip arthritis minimum 2 years post infection. The patient's age at onset of infection and the treatment received for management of acute septic arthritis were noted from the records. The functional outcomes were assessed using Lower Extremity Functional Scale (LEFS) and Children Health Assessment Questionnaire (CHAQ) [11, 12]. These two questionnaires quantify overall functional ability in daily life activities and the disability index in the presence of a multiple

joint pathology [11, 12]. Follow up radiographs of both hips were obtained and were classified according to Choi's classification [8].

The LEFS is a validated questionnaire commonly used to evaluate the functional impairment of a patient with a disorder of one or both lower extremities [11]. It contains 20 questions about a person's ability to perform everyday tasks. The lower the score, the greater the disability. The percentage of maximal function is given by the formulae (LEFS score) / 80 * 100.

The CHAQ evaluates the following eight domains of daily living: dressing, arising, eating, walking, hygiene, reach, grip and activities (30 items) [12]. The response scores for each item range from 0-3. The highest score of an item within a domain determines the score. The utilization of assistance or aids in domain set the score to a minimum of two. The mean score of the eight domains determines the CHAQ disability index (CHAQ-DI) and ranges from zero (no disability) to three (disabled).

Choi has classified the sequelae of septic hips into 4 types each with two subtypes, taking into consideration severity of involvement of proximal femur and coxofemoral instability [8]. The classification is considered useful in planning treatment as well as prognosticating.

Statistical calculations: The LEFS score was correlated to the CHAQ-DI and 'R' determined. Any hip grade with Choi grade 3B or above was considered unstable as these types had coxo-pelvic dissociation and always demanded a major surgical reconstructive measure [13]. The Choi 1, 2, and 3A grades were considered as stable (coxo-pelvic articulation present).

Table 1. Patient data (n=9)

S.no.	Age at first presentation (days)	Age at final follow-up (years)	Joints involved other than both hip joints	Primary intervention for acute septic arthritis	LEFS*	CHAQ-DI#	Choi classification (Rt hip)	Choi classification (Lt hip)	Remarks
1	3	6	-	AB	80	0	I B	I A	Stable
2	365	3	Lt knee	AB+Ar	76	0.04	II B	II B	Stable
3	9	8	-	AB	74	0.17	IV A	IV B	Unstable
4	60	9	Rt knee	AB+Ar	72	0.11	II A	I B	Stable
5	210	4.7	Rt shoulder	AB+Ar	70	0.11	II B	II B	Stable
6	3	6	-	AB	69	0.19	IV B	II B	Unstable
7	730	10	-	AB+Ar	48	0.29	IV A	II B	Unstable
8	15	19	Both knee, Lt ankle, Lt shoulder, Lt elbow	AB+Ar	43	0.44	IV B	IV B	Unstable
9	4	3	Lt knee	AB	32	0.33	II B	II B	Stable

* Lesser scores indicate lower functional outcomes; # Higher scores indicate more disability; Abbreviations: AB- antibiotics; Ar- arthrotoomy; Rt-Right; Lt- Left

We labelled the patient as having instability if either hips had a Choi type >3A. The LEFS/ CHAQ-DI scores for patients with stable and unstable hips were also compared using the unpaired student t test.

Results

The details of nine patients with bilateral septic sequelae of hip joints whom we were able to contact are presented in Table 1. The mean age at final follow-up was 7.6 years \pm 5.0 (mean \pm SD), ranging from three to 19 years. There were four males and five females. Out of nine followed patients, one patient had already attained skeletal maturity. Four patients had involvement of only bilateral hip joints; rest five patients had post septic involvement of other joints also in addition to the hip joints. The mean number of joints involved in our series was 3 ± 1.6 . On record review, it was found that five patients developed septic arthritis in the neonatal period, three patients had onset of disease in infancy, and one patient developed bilateral hip septic arthritis at the age of two years. Four out of nine patients had received only intravenous antibiotics as management. All these five patients had history of neonatal intensive care admissions. The diagnosis of bilateral hip joints septic arthritis was either missed initially (n=3) or the decision to do arthrotomy was postponed due to child's hemodynamically unstable condition (n=1). Rest of the five patients underwent arthrotomy of both joints and culture directed antibiotics. Till final follow-up, five out of nine patients had received secondary surgical intervention for the sequelae.

The mean LEFS score was 62.7 ± 17.1 ranging from 32 to 80. Five patients had LEFS score of 70 or above. Three patients had poor LEFS score below 50. The mean disability index using CHAQ-DI was 0.2 ± 0.1 ranging from 0 to 0.4. According to radiographic Choi's classification, out of total 18 hips, 8 hips were 2B, 4 were 4B, 2 hip joints each were of Choi's 1B and 4A types, and one hip each was of type 1A and 2A (Figure 1, 2). Two patients had one of their hips as Choi type 4A and contralateral hip of Choi type 2B. Two patients had bilateral Choi type 4 (one side 4A and other side 4B) hips. Five patients had both hips of lower Choi type with preserved coxo-pelvic continuity and contained hip i.e., up to 3A.

The mean LEFS values for radiological stable hips was 66 ± 19.4 and 58.5 ± 15.3 for unstable hips ($p= 0.5487$) while corresponding CHAQ-DI scores were 0.12 ± 0.13 and 0.27 ± 0.12 respectively ($p=0.1098$) indicating poor relatability between functional capabilities of the child and the radiological appearances of the hips. A strong negative correlation however existed between LEFS/ CHAQ-DI values ($R= -0.897$; $p=0.001$). Patients with involvement of other joints other than hip had lower LEFS scores (58.6 ± 19.8) compared to those with bilateral hip involvement (67.8 ± 13.9) although not statistically significant ($p=0.4613$).

Discussion

There is a wide spectrum of functional morbidity and radiological changes resulting from septic sequelae of hip. Physeal involvement leads to limb length discrepancy (LLD), angular and rotational deformities. Loss of joint congruency, instability, premature degenerative changes and LLD may lead to pain and limping. Septic arthritis involving bilateral hips may be worst as the mechanisms of the other limb are also compromised and this might have the larger toll on locomotion and subsequently quality of life.

In the present retrospective series, we assessed the functional and radiological outcomes in patients with bilateral septic hip sequelae. We found that these patients generally reached moderate LEFS scores. The mean LEFS score in our series was 62.7. Three patients had poor LEFS score < 50. Poor LEFS scores patients necessarily needed support to walk outdoors. Lower LEFS scores were found in patients with additional joint involvement besides the hips. Corresponding disability index using CHAQ-DI matched the LEFS scores. The mean disability index was 0.2. The three patients with highest disability indices had CHAQ-DI of 0.44, 0.33 and 0.29. Our study also indicated that in the pediatric age group, the child's functional status was independent of the hip's radiological findings although patient with stable hips generally had higher functional scores. This is a reminder of the old fact that children with poor radiographs can have reasonable outcome and vice versa [4, 5].

Some of our patients had multiple joint involvements and we therefore embarked upon questionnaire such as LEFS and CHAQ-DI to assess their functionality and morbidity status. These scores provided a fair estimate of the overall functional ability of these children. Precise reference values for LEFS in pediatric age group are missing in literature. The normative data for LEFS in adults hovers around 77, values <70 generally indicate less satisfactory outcome and those with values around 40 are considered unfit for work [14]. Only one patient had score <40 in our series. Five patients had LEFS scores ≥ 70 i.e. 56% of the children were able to perform their activities of daily living reasonably. The disability score CHAQ-DI has typically being utilized for conditions for multiple joint involvements such as rheumatic disorders, cerebral palsy, achondroplasia, chronic musculoskeletal disorders, hemophilia, osteogenesis imperfecta and autoimmune diseases [15]. As an example, Sontichai et al estimated disability index in 812 patients with juvenile idiopathic arthritis [15]. Six hundred and six patients had active disease with mean CHAQ-DI of 0.40 ± 0.57 and 206 were having inactive disease with mean CHAQ-DI of 0.01 ± 0.08 . Our mean CHAQ-DI for bilateral septic sequelae was 0.2 ± 0.1 matching indices of a burnt-out rheumatic disease. A strong negative correlation however existed between LEFS/ CHAQ-DI values. Thus, as expected, patients with low LEFS

scores had higher disability index.

Our series had the drawback of being a single hospital-based retrospective case series. Investigation of other prognostic factors for septic hip sequelae, such as delayed diagnosis or treatment, prematurity, was not part of our evaluation. Also, there were differences in the age of presentation, initial sepsis management, surgical treatments, and length of follow-up. Since the majority of patients were not skeletally mature, surgical procedures in future and further changes in the developing musculoskeletal system may evoke different outcomes. Involvement of lower limb joints other than bilateral hip joints in four out of nine patients also affected the child's overall functional outcome. We could not compare the functional and radiological outcomes of our patients at follow up with past literature as the same was unavailable. The statistical calculations made above have limitations in view of the small patient numbers in each subgroup. Having said that, this is first ever attempt to bring out the functional limitations faced by a child with bilateral septic sequelae hip. The child with bilateral septic sequelae of hip especially with Choi type >3A (unstable hips) although initially painless, may suffer instability during walking. Gait difficulties are added on by accompanying limb length discrepancy. Available options should be discussed with the family and the child explaining pros and cons of each method. Surgical decisions should take

into account the socioeconomic background of the family, functional requirements, age of the child, previous surgeries, residual infections and bone condition, limb length discrepancy, associated affections of other joints including upper limb, status of acetabulum and triradiate cartilage and Choi types on both sides. Among possible treatment options, commonly used are conservative management using orthosis and shoe raises, limb length equalizations, pelvic support osteotomy, arthrodesis and total hip replacement.

The bilateral septic arthritis of hip although rare, still exists in low income and developing world. Its crippling nature and resultant disability should serve a strong reminder for high index of suspicion, diagnosis and aggressive management for this pathology.

Conclusion

Septic hip sequelae in children leads to various degrees of functional limitations and patients with multiple joint involvement have worse outcomes. The hip radiological findings do not relate with the overall functional status of the child.

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Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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