

Outcome Subtrochanteric Varus Osteotomy for Treatment of Perthes Disease in Short Period

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Abstract:

Background: Legg – Calve – Perthes disease (LCPD) is described as idiopathic osteonecrosis of the femoral head leading to varying complications resulting in deformation of the femoral head and subsequently osteoarthritis ⁽¹⁾. Unlike normal, nutritious bone, in cases of LCPD, the bone of the avascular epiphysis cannot resist the pressures on the femoral head epiphysis.^(2,3)

Objectives: This study is designed to assess the outcome of subtrochanteric varus osteotomy for the treatment of Perthes disease..

Patients & Methods: This research is a cohort study conducted during the period from April 2017 to April 2019 at the Misurata Medical Center Outpatient Clinic of Orthopedic Surgery. Criteria for inclusion: Patients ' mean age was 8 years (range: 5–11 years).,

Results: This research as well as other research that proximal varus osteotomy is a reliable procedure in patients without advanced degeneration or flattening of the femoral head and in patients with good abduction and internal rotation, particularly when they are between 5 and 11 years old.. The findings are unsatisfactory for older patients as well as those with intensive femoral head deformation.

Conclusions: Varus subtrochanteric Osteotomy is an excellent method of treating Legg Calve Perthes disease patients. This surgery resulted in reduced pain, limping, and increased movement variety.

Keywords: Varus Osteotomy - Legg Calve Perthes- LCPD

INTRODUCTION

Legg – Calve – Perthes disease (LCPD) is described as idiopathic osteonecrosis of the femoral head leading to varying complications resulting in deformation of the femoral head and subsequently osteoarthritis⁽¹⁾.

Unlike normal, nutritious bone, in cases of LCPD, the bone of the avascular epiphysis can not resist the pressures on the femoral head epiphysis. The goal of treating Perthes disease is to lower the risk of subsequent osteoarthritis by avoiding deformation of the femoral head that can occur when sufficient containment is not attained ^(2,3)

Throughout the fragmentation and reossification phase, the femoral head is focused inside the acetabulum to attain containment. It enables the acetabulum to behave as a mould when the physiologically plastic femoral head is at possibility of subluxation, hinged abduction and permeant femoral head deformity. Extreme femoral head deformation and joint incongruity increase the chance of loss of function at skeletal maturity, resulting in subsequent osteoarthritis^(4,5,6).

Legg – Calve –Perthes disease has several techniques of treatment, and the suitable technique to use relies on the disease grade. These methods involve weight-relieving caliper spica cast immobilization, bed rest, traction, and walking ^(5,6,8).

In patients with perthes disease, surgical techniques are also used. Many researchers suggested non-operational means like bracing and casting immobilization and reported satisfactory results for most patients ^(9,10,11).

Many other researchers reported excellent results with surgical techniques such as femoral varus or valgus osteotomy, as well as other pelvic osteotomy kinds like innominate (Salter) pelvic osteotomy, lateral shelf osteotomy, and triple osteotomy ⁽¹¹⁾

The research was designed to evaluate the outcomes of proximal femoral varus osteotomy in perthes disease treatment in the short-term final result ^(11,1).

PATIENTS AND METHODS

This research is a retrospective and prospective cohort study conducted during the period from April 2017 to April 2019 at the Misurata Medical Center Outpatient Clinic of Orthopedic surgery.

Criteria for inclusion:

Patients ' mean age was 8 years (range: 5–11 years). All patients are at the stage of fragmentation. Criteria for exclusion: all patients are in re-ossification or healing phases, patient age above 11 years below 5 years, any neurological disorder as cerebral palsy, congenital deformity and any past hip surgery.

Containment is an attempt by actual or relative varus positioning to minimize forces through the hip joint, Non-operative or operational techniques can accomplish containment. Other researchers recommended surgical techniques for containment provision or maintenance. Surgical techniques of containment give the benefit of early mobilization and prevention of prolonged bracing or casting treatment.

Surgical intervention adjusts the bony structures to place the femur's head deep inside the acetabulum. Fixation is maintained with screws and plates that will be removed at a later date.

In some cases, the socket must also be deepened because the ball actually has enlarged during the healing process and no longer fits snugly within. After either procedure, the child is often placed in a cast from the chest to the toes for 6 to 8 weeks.

After the cast is removed, the child will take part in physiotherapy with the effected leg's protected weight bearing till X-rays show the final stages of healing.. A proximal femoral varus osteotomy procedure was used to treat 24 patients with Legg Calve Perthes disease in the Misurata Medical Center. Patients ' mean age was 8years (range: 5–11years). The median monitoring period was 14 months (range: 12–24 months).

Cases:

Age: 8 years old, **Gender:** male, **Diagnosis:** perthes disease stage B/C

Complaint; right hip pain and limping with limitation of hip movement. No medical history

Time of complaint: around 7 months before time of operation. Clinical assessment of the patient by modified Harris hip score was 63% (poor)

Limb length discrepancy: 98 mm , **Date of operation:** 03/ June/2017

Image: anteroposterior and lateral views x ray



Fig. 1: AP x ray Preoperative show osteonecrosis of hip joint right side for 8 years male child



Fig.2: Lateral view x ray Preoperative show osteonecrosis of hip joint right side for 8 years male child

Preoperative radiological assessment of head of femur: NFA:133⁰, EEI:14%

Management: The patient was admitted to Misurata medical center at the orthopedic department and prepared for subtrochanteric varus osteotomy.

Lab investigation: complete blood count, kidney functions, ESR and CRP were within normal values

Operation steps: Under general anesthesia, supine position using lateral approach and varus osteotomy of subtrochanteric femur with 20-degree pre-bent DCP fixation.

Follow up: he continued follow up in the outpatient clinic after two weeks, a month, three months and six months, nine months. There was no complication in follow up where osteotomy site united within 3 months, no implant failure and no infection. There is good improvement after operation according to clinical assessment by modified Harris hip score and radiological assessment. mHHS was 91, limp length discrepancy no significant changes, EEI=6%, and NSA=113⁰



Fig.3: AP x ray 3-month postoperative show reshape head of femur of hip joint right side for 8 years male child



Fig. 4 AP x ray 13-month postoperative show reshape head of femur of hip joint right side for 7 years male child

RESULTS:

Table 1: demonstrated Age, sex side and types of classification of patient's numbers.

Case No.	Age	sex	side	Herring classification
1	5	M	Rt	B
2	7	M	Rt	B
3	7	F	Lt	B/C
4	8	M	Rt	B/C
5	6	F	Rt	C
6	6	M	Lt	B/C
7	7	M	Lt	B/C
8	10	M	Lt	B/C
9	6	F	Rt	B/C
10	8	F	Rt	C
11	9	F	Rt	B
12	5	M	Lt	B/C

13	11	M	Rt	C
14	6	F	Rt	B/C
15	6	M	Rt	C
16	8	F	Lt	B
17	11	M	Rt	B
18	9	F	Lt	B/C
19	7	F	Lt	C
20	9	M	Rt	C
21	8	M	Rt	B
22	9	M	Lt	B/C
23	6	M	Rt	B
24	7	F	Lt	C

Table 2: demonstrated preoperative clinical and radiological evaluation of the patients.

Case Nr.	mHHS %	NSA c ⁰	EEI %
1	60	155	15
2	65	138	25
3	54	136	14
4	70	135	14
5	57	151	18
6	62	149	16
7	65	147	15
8	72	155	13
9	58	150	13
10	72	142	15
11	60	152	20
12	63	155	20
13	66	135	20
14	65	143	18
15	67	145	15
16	59	149	13
17	71	138	18
18	69	151	19
19	62	153	19
20	63	138	18
21	65	141	15
22	58	140	17

23	60	139	16
24	61	138	19

Table 3: postoperative final clinical and radiological assessment of the patients (mHHS modified harris hip score, NSA neck shaft angle, EEI epiphyseal extrusion index)

Case Nr.	mHHS %	NSA c⁰	EEI %
1	91	113	7
2	85	118	7
3	88	122	9
4	87	119	8
5	90	132	13
6	85	127	10
7	87	122	7
8	90	131	7
9	85	122	9
10	90	118	8
11	81	118	8
12	90	125	7
13	90	113	7
14	90	119	8
15	81	118	11
16	88	122	10
17	90	123	11
18	91	115	9
19	87	120	12
20	90	123	8
21	85	117	8
22	87	117	8
23	84	119	9
24	88	120	7

Table 4: Leg shortening distribution.

	Shortening / mm
Mean ±SD	9.25±2.54
Median (Range)	9.0 (5-13)

Distributed as 9.25±2.54 mm

Table 5: Neck shaft angle pre and post operative

	Neck shaft angel pre	Neck shaft angel post
Mean \pmSD	144.25 \pm 5.29	121.55 \pm 6.56
Median (Range)	148.0 (133-154)	119.0 (113-132)

Neck shaft angel pre significantly decrease from 144.25 \pm 5.29 to 121.55 \pm 6.56

Table 6: Epiphyseal extrusion index distribution

	EEI-PRE	EEI-POST
Mean \pmSD	17.06 \pm 3.33	9.41 \pm 2.86
Median (Range)	15.5 (13-20)	8.0 (6-13)

Significantly decrease from 17.06 \pm 3.33 to 9.41 \pm 2.86

Table 7: Harris hip score pre and postoperative show in table

	Harris pre	Harris post
Mean \pmSD	67.22 \pm 7.55	88.16 \pm 2.65
Median (Range)	67.5 (54-72)	87.5 (81-91)

Harris significantly increase from 67.22 \pm 7.55 to 88.16 \pm 2.65

Table 8: Complication distribution

		N	%
Infection	No	22	91.7
	Yes	2	8.3
Implanting failure	No	24	100.0
	Yes	0	0.0
Non union	No	23	95.85
	Yes	1	4.15

Only two cases had infection post OP and one case had only nonunion

DISCUSSION

Legg Calve Perthes illness is a juvenile idiopathic osteonecrosis where the blood flow of the femoral head is insufficient and the bone dies temporarily⁽¹²⁾. It is a main causative agents of premature hip arthritis and often requires early adulthood replacement of the hip. This can also result to irritability of the hip joint and deformity of the femur's head based on the severity ⁽¹³⁾. It's one of the most prevalent but most misunderstood abnormalities that pediatric orthopedic surgeons have experienced. Legg Calve Perthes disease happens mainly in boys between the ages of 4 and 8 and in a number of small hospital-based research has been involved with social and economic disadvantage. Occurrence varies across nations and also depends on race (10.8 per 100,000 Caucasian children, 0.45 Negroid children ⁽¹⁴⁾).

Legg Calve Perthes disease etiology theories include cigarette smoke exposure, behavioral problems, unknown coagulopathy, and dietary shortcomings. The process of the disease is unclear, but is probable to be multifactorial and could even effect genetics or deprivation. There was no satisfactory solution to any of these theories ⁽¹⁵⁾. The only consistent discovery is that the impacted children have disproportionate skeletal growth, with short hands and feet comparative to the head and trunk size, This indicates that it is a true growth abnormality between many children impacted and not merely a deprivation effect LCPD-related problems

involve reduced hip joint movement range, particularly abduction, and alternation in femoral bone growth that can cause to discomfort when walking.. Long-term results include instability or decreased range of movement of the hip joint and extended prevalence of osteoarthritis ⁽¹⁶⁾. In Legg Calve Perthes disease, a variation of forms of treatment are often used to preserve hip joint movement and to alleviate clinical symptoms (particularly pain) and contain the hip joint. Therapies can be categorized as techniques that are operative and non-operational, Treatment of Legg Calve Perthes disease remains unclear in older children with increased femoral head influence. Innominate, femoral or combined osteotomies usually give the acetabulum more protection of the femoral head with the goal of reaching a more spherical head and compatible joint ⁽¹⁵⁾.

1- Leg shortening distribution and Postoperative scores of the studied groups:

The present study showed that the distribution of Leg shortening was 9.25 ± 2.54 mm, Table(4).

Suba and Yildirim (1999) demonstrates that in the last follow-up, the length estimations gave a mean 0.8 cm. Shorting on the operated side (range, 0.0 to 2.3 cm). The test of Trendelenburg in two patients was positive ⁽¹⁷⁾

Elzohairy, ⁽¹⁾ came in consistency with us after he demonstrated that the difference in the length of the Mean limb had been 0.9 cm (variety: 0.0–2 cm) in shortening on the operated side compared to the normal side at the last plate elimination follow-up ⁽¹⁾.

Shah and Joseph, 2013 showed that, in un-operated patients, the imply shortening of the lower limb had been 5.05 ± 6.74 mm and 9.03 ± 7.68 mm ; this discrepancy was statistically significant ⁽¹⁸⁾.

Rowe et al., ⁽¹⁹⁾ Confirmed that the sum of shortening of the affected legs in LCPD is widely accepted depending almost solely on the prevalence of endochondral ossification inhibition in the proximal femoral growth plate.. Furthermore, the reduction of epiphysal height, the disuse of the diseased limb atrophy and the performance of FVO in older children are regarded to make a contribution to the reduction of the affected leg.

Our research found that angel of the neck shaft pre significantly decreased from 144.25 ± 5.29 to 121.55 ± 6.56 . **Table. (5)**. In our research, the distribution of the Epiphyseal extrusion index decreases considerably from 17.06 ± 3.33 to 9.41 ± 2.86 **Table. (6)**.

In our study Harris score significantly increase from 67.22 ± 7.55 to 88.16 ± 2.65 **Table (7)**.

Shah and Joseph , 2013 ⁽¹⁸⁾ Illustrated a moderate decrease in the range of passive inner hip rotation in many patients (both operated and non-operated) relative with the normal side (mean internal hip rotation: 28.57 ± 13.88 ; mean internal hip rotation: 26.77 ± 16.15 ; t: 0.60; p = NS). The distinction between the pre-operative and the final evaluation was also statistically relevant.

Glard et al. ⁽²⁰⁾ noted that the grade of varus angulation at the site of osteotomy was restricted to 20. Many authors tended to angulate the FVO to a much higher degree

Moghadam et al., ⁽²¹⁾ illustrated in their study that abnormal femoral neck angel in 22 patients (75.9%).

Joseph et al., ⁽²²⁾ Researched how femoral osteotomy alters the natural development of Perthes disease by evaluating records and x-rays of 640 Perthes disease patients.. Data from 314 patients with femoral osteotomy have been compared with patients without surgery. A varus osteotomy was observed to obviously change the natural development of the Perthes disease. Of patients operating in the avascular necrosis stage, 34 percent bypassed the fragmentation stage. In these patients the duration of the disease was shorter. The duration of the fragmentation stage was decreased in children operated which had gone via the fragmentation stage. At the stage when it is most susceptible to deformation, the magnitude of femoral head extrusion was lessened. ⁽²²⁾

Elzohairy, ⁽¹⁾ reported that during follow-up period, particularly after device elimination and in younger boys, no progressive change in this measurement was observed. Limping was recorded for all patients due to difference in limb length and gluteal weakness, however this continued to improve over the course of 8 months after surgery All osteotomies united without failure of fixation within 3 months

2-Complications distribution among the studied groups:

Our research found that it only two cases had post-operative infection and only one case had nonunion. **Table (8).**

In a comparative analysis by **Voplon** ⁽²³⁾, where he used arthrodistraction as a initial treatment for active types of LCP disease and compare results prospectively with those obtained with Salter innominate osteotomy, Although analogous radiological results were obtained from the methods, morbidity with arthrodistraction was higher than with innominate osteotomy. Therefore, arthrodistraction is not recommended by the author as a primary treatment for the early stages of Legg – Calve'-Perthes disease ^[20].

Leunig and Ganz, ⁽²⁴⁾ 14 patients with hip and trochanteric dislocation with a lowest 3-year follow-up were reported. They discovered in this patient population, without any major complications observed, pain, hip mobility, and gait improved significantly.

Limitations

The limitations of this study were the fact that they included the varying nature of Perthes disease (which makes it hard to research the condition) and the use of various classification systems and result measures (which causes confusion). Analysis of surgical interventions is hampered through the use of small groups of subjects, the rare use of a control group, the unparalleled selection of patients of different ages, and the varying seriousness of the disease process. Our findings suggest that severe Legg Calve Perthes disease treatment has not been well-defined. Depending on the characteristics of each patient, the surgeon must make his own decisions. realize that subtrochanteric varus osteotomy is a accurate treatment in patients without developed femoral head degeneration or flattening and in those with nice abduction and internal rotation containment, particularly if they are between 5-11 years old. The findings are unsatisfactory for older patients and those with developed femoral head deformation.

Conclusion:

The findings of this study, proximal femoral varus osteotomy, yield good results in children who have been fragmented according to herring classification (B, B / C, C) and ages between 5 and 11 years without any femoral head deformation and flattening, particularly with good containment in abduction.

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