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ORIGINAL ARTICLE

Outcome of Varus De-rotational osteotomy in patients of perthes disease.

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ABSTRACT… Objective: To evaluate the clinical and radiological outcomes of Varus De-rotational Osteotomy (VDRO) in children with unilateral Perthes disease using the Harris Hip Score (HHS), Mose's Index, and Stulberg Classification. **Study Design:** Prospective, observational, cohort study. **Setting:** Orthopaedics Department of Jinnah Postgraduate Medical Center, Karachi, Pakistan. **Period:** October 2024 and August 2025. **Methods:** A total of 21 children of either gender, aged 5–12 years, having unilateral Perthes disease and planned to undergoing VDRO were analyzed. Clinical and radiological evlauations were performed. VDRO was performed adopting standard lateral approach with varus and derotation correction under fluoroscopy. Postoperative care involved immobilization, physiotherapy, and follow-up evaluations were made after 6 months. Data were analyzed using SPSS 26.0 with p<0.05 set as significance level. **Results:** In a total of 21 children, 12 (57.l%) were male, and the overall mean age was 8.24±2.23 years. The right hip was involved in 12 (57.1%) children. At presentation, hip pain was noted in 9 (42.9%), and limp in 5 (23.8%) patients. HHS improved across all stages, highest in Stage III (61.25→88.75). Outcome distribution included 28.6% excellent, 23.8% good, 33.3% fair, and 14.3% poor, with no significant association with stage (p=0.285). Pain improved in 17 (81.0%), limp resolved in 13 (61.9%), and abduction improved in 11 (52.4%) patients. Postoperative complications included infection in 9 (42.9%), non-union in 6 (28.6%), and limb length discrepancy in 5 (23.8%) patients. **Conclusion:** VDRO is an effective surgical option for improving clinical and radiological outcomes in Perthes disease, though postoperative complications remain a concern.

Key words: Children, Harris Hip Score, Mose's Index, Perthes Disease, Varus de-rotational Osteotomy.

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INTRODUCTION

Perthes disease, also known as Legg-Calvé-Perthes disease (LCPD), is an idiopathic condition characterized by avascular necrosis of the femoral head in children.[1] LCPD leads to significant deformation of the hip joint if not treated appropriately, especially in cases presenting after the age of seven, which are associated with worse outcomes.[2] LCPD has a prevalence rate of about 1 in 1,200 children globally and affects males more frequently than females. The primary goal of management is to maintain or restore the sphericity of the femoral head within the acetabulum, allowing for normal joint congruity.[3] While conservative management is preferred in younger patients (below six years), surgical interventions are usually necessary for older children.[4] Varus De-rotational Osteotomy (VDRO) is among the most common surgical methods applied to better femoral head containment in the acetabulum during the crucial stages of the disease, known as revascularization.[5] The indications for this procedure were to prevent later complications from LCPD, including osteoarthritis, limitation of motion, and leg length discrepancy.[6,7]

This study was done to assess the clinical and radiographic outcomes of VDRO for patients diagnosed with Perthes disease. The specific aim was to evaluate the clinical and radiological outcomes of VDRO in children with unilateral Perthes disease using the Harris Hip Score (HHS), Mose's Index, and Stulberg Classification. The radiographic outcomes of VDRO were evaluated, including femoral head sphericity and acetabular congruency as determined by Mose's Index and the Stulberg Classification.

METHODS

This prospective, observational, cohort study was conducted at the Department of Orthopedic Surgery, Jinnah Postgraduate Medical Center, Karachi, between October 2024 and August 2025.

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Sample size calculation was done using G*Power version 3.1.9.7, for a paired-sample design comparing pre- and postoperative HHS following VDRO, with difference between two dependent means (matched pairs)" test family selected, and a two-tailed α of 0.05, power of 0.80, and an assumed correlation of 0.5 between paired measures. A mean improvement of 15±15 points in HHS (Cohen's d=1.0) was expected, yielding a minimum requirement of 10 paired observations. A purposive sampling technique was adopted for patient selection. Children aged 5 to 12 years diagnosed with unilateral Perthes disease who underwent VDRO as their primary surgical procedure and had at least 12 months postoperative follow-up were included. Patients with bilateral involvement, a history of prior hip surgeries, or comorbidities such as cerebral palsy or metabolic bone disorders were excluded from the study.

The ethical committee of the Institutional Review Board approved this study (NoF.2-81/2025-GENL/204-H/JPMC). Written informed consent was obtained from all children's parents or guardians regarding the objectives of the study, the nature of surgery, risks involved, and expected benefits. This study followed the principles of the Declaration of Helsinki, and no patient identifier was used to provide anonymity. All children underwent thorough preoperative assessment, including clinical examination, anthropometric measurements, and radiographic staging. Symptomatology included pain, limp, limited range of motion, and leg length discrepancy. Abduction, internal rotation, and gait were examined in all children by a senior orthopedic resident under consultant supervision. All patients had radiographs of the pelvis in anteroposterior and frog-leg lateral views, and disease staging was done according to standard Perthes classification systems. Surgical planning was done by measuring the degree of varus and rotational correction that would achieve optimal femoral head containment.

All VDROs were performed under general anesthesia by the senior orthopedic surgeon, assisted by a postgraduate trainee and anesthetic team. Using a standard lateral approach to the proximal femur, a controlled transverse osteotomy was created below the lesser trochanter. The femoral shaft was angulated into varus and internally rotated in such a way that about 7.5 degrees of varus and 20 degrees of derotation were achieved, confirmed intraoperatively with fluoroscopy. Fixation was achieved with an appropriate pediatric dynamic compression plate or an angled blade plate, followed by layered wound closure over a suction drain. In all cases, perioperative antibiotic prophylaxis with intravenous ceftriaxone was administered, and a hip spica cast or abduction brace was used for postoperative immobilization.

The postoperative management included routine wound inspection on the 10th day and early physiotherapy after the discontinuation of immobilization. The rehabilitation was guided by a physiotherapist: gradual weight-bearing, hip abduction, and strengthening exercises. Final outcomes were evaluated at 6 months post-surgery. For clinical evaluation, HHS system was adopted, which assesses pain, mobility, and function. The scores were classified as follows: poor (<70), fair (70-80), good (80-90), and excellent (>90). Radiographs were taken during each follow-up visit to assess femoral head sphericity using Mose's index and long-term morphology according to the Stulberg classification.

For statistical analysis, IBM-SPSS version 26.0 was used. Continuous variables were expressed as mean±standard deviation or median and IQR, while categorical variables were expressed as frequencies and percentages. Paired t-tests or wilcoxon ranked test were used for comparing preoperative and postoperative HHS and radiographic parameters. Spearman's correlation coefficient evaluated the correlation between preoperative stage and postoperative outcomes, and chi-square/fisher's exact assessed the categorical associations. A p value less than 0.05 was considered statistically significant.

RESULTS

In a total of 21 patients, the mean age was 8.24 ± 2.23 years, with 12 (57.1%) between 5 and 8 years. The mean weight was 33.24±6.45 kg, and the mean height was 98.05±10.73 cm, resulting in a mean BMI of 34.94±6.75 kg/m^2. There were 12 (57.1%) male, and 9 (42.9%) female patients. Most patients

(85.7%) were of Asian ethnicity, followed by 9.5% African and 4.8% Caucasian. The mean age at diagnosis was 6.00 ± 1.44 years, while the mean age at surgery was 7.35 ± 1.98 years. Concerning the affected hip, the right hip was involved in 57.1% of cases, while the left hip was affected in 42.9%.

TABLE-I

Clinical presentation pre-surgery of the patients before surgery

Variables		Frequency (%)
Symptoms	Limp	5 (23.8)
	Hip Pain	9 (42.9)
	Limited Range of Motion	3 (14.3)
	Leg Length Discrepancy	4 (19.0)
Severity of Pain	Moderate Pain	1 (4.8)
	Severe Pain	14 (66.7)
	Worst Pain	6 (28.6)
Conservative Treatment Tried Before Surgery	Physiotherapy	8 (38.1)
	Traction	1 (4.8)
	Bracing	3 (14.3)
	Medication	2 (9.5)
	No treatment	7 (33.3)
Hip Abduction and Internal Rotation Limited Prior to Surgery	Yes	12 (57.1)
	No	9 (42.9)
Pre-Operative Radiographic Stage	Stage I	3 (14.3)
	Stage II	6 (28.6)
	Stage III	8 (38.1)
	Stage IV	4 (19.0)
Intraoperative Complications	Yes	4 (19.0)
	No	17 (81.0)

The main symptoms were hip pain in 9 (42.9%), followed by limp in 5 (23.8%), leg length discrepancy in 4 (19.0%), and restricted range of motion in 3 (14.3%). The severity of pain was generally rated as severe, with a high 66.7%; 28.6% describing the pain as worst and 1 (4.8%) as moderate. The mean duration of complaints before surgery was 11.96±7.04 months. Regarding the treatment pattern before the surgeries, 8 (38.1%) had physiotherapy. The radiographic stage of the disorder before surgery revealed Stage III in 38.1%, followed by Stage II in 28.6%, Stage IV in 19.0%, and Stage I in 14.3% of the cases. The surgical procedures resulted in a mean varus correction of 7.51±0.22 degrees and a mean rotational correction of 19.82±0.96 degrees. The mean operating time was 1.19±0.38 hours, with intraoperative complications occurring in 4 (19.0%) of the patients. Table-I presents the clinical characteristics and preoperative presentation of the patients.

For patients with radiographic Stage I, the mean pre-operative HHS increased from 64.00±6.55 to 82.00±11.35 post-operatively (r=0.124; p=0.824). In Stage II, the HHS rose from 67.83±10.45 to 81.67±12.12 (r=0.551; p=0.257). Patients in Stage III experienced an increase in HHS from 61.25±6.84 to 88.75±9.48 (r=-0.367; p=0.372). Stage IV patients showed an improvement from 59.75±8.88 to 83.25±4.42 in HHS, with a weak negative correlation (r=-0.362; p=0.638), and the details are shown in Table-II.

The relationship between preoperative disease stages and postoperative outcomes (Table-III) showed varying distributions of results. In Stage-I, 16.7% of patients achieved excellent outcomes, while 40.0% had fair outcomes, with no poor outcomes observed. Stage II had 16.7% excellent outcomes, 25.0% good, 40.0% fair, and 50.0% poor outcomes, reflecting a more diverse distribution. Stage III demonstrated the highest proportion of excellent outcomes at 66.7%, with 37.5% achieving good outcomes and 50.0% poor outcomes. In contrast, Stage IV had no excellent outcomes, 37.5% good, and 20.0% fair outcomes, with no poor outcomes observed. The chi-square test applied revealed a p-value of 0.285, indicating no statistically significant relationship between preoperative disease stage and postoperative outcomes (Table-III).

Pain scores significantly improved, with 81.0% improvement at six months. The limp postoperatively was variable, with 61.9% having no limp, 23.8% having a mild limp, and 14.3% reporting a severe limp. Postoperative leg length discrepancy was seen in 85.7% of patients, which was mild (<2 cm) in 57.1%, severe (>2 cm) in 28.6%, while 14.3% had no discrepancy. Hip range of motion assessments showed that abduction improved by 52.4% at six months, and internal rotation improved

by 38.1% at six months. Radiological indices, including Mose's index for sphericity of the femoral head, demonstrated an improvement of 33.3% at six months, while the epiphyseal extrusion index showed a reduction, with scores at 57.1% at six months. Complications noted in the postoperative period included infection in 42.9%, nonunion at the osteotomy site in 28.6%, limb length discrepancies in 23.8%, and hardware-related complications in 4.8% of cases.

Comparison of QoL post-surgery, based on the outcome variables, showed that the majority of the patients believed their QoL had improved after surgery. The distribution of the patients was 100% in the "Excellent" category, 62.5% in the "Good" category, 80.0% in the "Fair" category, and 50.0% in the "Poor" category. However, the differences were not statistically significant (p=0.321). With respect to the Patient-Reported Outcome Measures, a good proportion of the patients reported pain-free mobility-50.0% in the "Excellent" group, 50.0% in the "Good" group, and 80.0% in the "Fair" group. No person in the "Poor" group was able to achieve pain-free mobility. Good ability to perform activities of daily living was also more commonly reported among those in the "Good" group, 50.0%, followed by the "Fair" group, 20.0%, whereas no person in the "Poor" group reported this ability. Participation in sports and physical activities was only noted in the "Excellent" group (16.7%). Regarding additional surgeries or interventions, none of the "Excellent" patients required further procedures, while 25.0% of the "Good" group needed additional interventions. No patients in the "Fair" or "Poor" groups required extra surgeries, with no significant differences (p=0.309).

Discomfort or complications at the osteotomy site were reported by a small proportion of patients across all outcome categories. In the "Excellent" and "Good" groups, 16.7% and 12.5% reported discomfort, respectively. In the "Fair" group, 20.0% experienced discomfort, and 50.0% of those in the "Poor" group reported complications. The differences in discomfort or complications were not statistically significant (p=0.685) (Table-IV).

DISCUSSION

LCDP is a rare pediatric hip joint disorder that can have long-term complications if the treatment is not received.[8] When the femoral head, the ball of the thigh bone, does not receive sufficient blood flow, the disease develops and causes bone necrosis.[9] This may result in the femoral head collapsing and flattening, which could cause discomfort, stiffness, and possibly the early onset of osteoarthritis.[10] The primary surgical approach typically involves a proximal femoral osteotomy to address the varus and rotational deformities.[11]

TABLE-II

Comparison between pre and post operative Harris Hip Scores and disease stages (N=21)

Staging	Pre-Operative HHS	Post-Operative HHS	Correlation (r)	P-Value
I	64.00 ± 6.55	82.00 ± 11.35	0.124	0.824
II	67.83 ± 10.45	81.67 ± 12.12	0.551	0.257
III	61.25 ± 6.84	88.75 ± 9.48	-0.367	0.372
IV	59.75 ± 8.88	83.25 ± 4.42	-0.362	0.638

Applied Paired Sample t-test

TABLE-III

Relationship between preoperative disease stage and postoperative outcomes after 6-months (N=21)

Disease Stage	Excellent (%)	Good (%)	Fair (%)	Poor (%)	P-Value
Stage-I	1 (16.7)	0 (0.0)	2 (40.0)	0 (0.0)	0.285
Stage II	1 (16.7)	2 (25.0)	2 (40.0)	1 (50.0)	
Stage III	4 (66.7)	3 (37.5)	0 (0.0)	1 (50.0)	
Stage IV	0 (0.0)	3 (37.5)	1 (20.0)	0 (0.0)	

Applied Chi-Square test

TABLE-IV

Comparison of quality of life after surgery with outcomes evaluation after 6 months (N=21)

	Variables	Excellent (%)	Good (%)	Fair (%)	Poor (%)	P-Value
QoL	Improved	6 (100.0)	5 (62.5)	4 (80.0)	1 (50.0)	0.321
	Not Improved	0 (0.0)	3 (37.5)	1 (20.0)	1 (50.0)	
PROM	Pain-free mobility	3 (50.0)	4 (50.0)	4 (80.0)	0 (0.0)	0.355
	Ability to perform daily activities	2 (33.3)	4 (50.0)	1 (20.0)	2 (100.0)	
	Participation in sports and physical activities	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	
Additional Surgeries or Interventions	Yes	0 (0.0)	2 (25.0)	0 (0.0)	0 (0.0)	0.309
	No	6 (100.0)	6 (75.0)	5 (100.0)	2 (100.0)	
Discomfort or Complications at The Osteotomy Site	Yes	1 (16.7)	1 (12.5)	1 (20.0)	1 (50.0)	0.685
	No	5 (83.3)	7 (87.5)	4 (80.0)	1 (50.0)	

In this study, the mean age of children 5-8 years was 57.1% while >8 years were 42.9% which illustrates a relatively early onset of hip issues in this population with the majority of male children at 57.1% and female children at 42.9%, highlighting a possible demographic trend worth noting for future research. The cohort's anthropometric data, which include a mean BMI of 34.94±6.75 kg/m2, point to a propensity for overweight or obesity, which has been linked to a higher risk of musculoskeletal disorders, such as hip deformities and a slower rate of recovery following surgery.[12,13] Obesity can exacerbate the clinical management of pediatric hip problems by contributing to altered biomechanics and joint stress.[14]

According to a preoperative presentation, hip pain was the most prevalent symptom (42.9%), which is in line with the contemporary data that hip pain is the primary symptom of pediatric hip diseases including Perthes disease and slipped capital femoral epiphysis (SCFE).[15] The approximately 12-month symptom duration before surgery indicates a delay in diagnosis or referral, which has been a persistent problem in the treatment of hip abnormalities in children.[16] Early diagnosis and treatment are especially important for preventing long-term issues like avascular necrosis and joint deformity, especially in disorders like SCFE and LCPD.[17]

Before surgery, a sizable fraction of patients in this sample (33.3%) did not undergo any conservative treatment. Considering that early non-operative treatment, such as bracing and physiotherapy, is frequently advised for certain hip disorders, this is significant.[18] The low effectiveness of conservative therapy in advanced cases or the severity of the disease at the time of presentation could be the reasons for the comparatively high rate of surgical surgery without prior non-operative treatment.

The majority of patients (38.1%) were in Stage III, according to radiographic evaluation, whereas a smaller percentage of the group were in Stage I or Stage II. For hip deformities like SCFE, where the majority of patients present with intermediate stages of the illness at diagnosis, this distribution of disease stages is consistent with the expected course of the condition.[19] With a mean varus correction of 7.51 ± 0.22 degrees and a rotational correction of 19.82 ± 0.96 degrees, the surgical procedures show that abnormalities can be effectively corrected. These findings are in line with others showing positive surgical outcomes after young patients' hip abnormalities were treated with osteotomy operations.[20,21] Although radiographic alignment was improved surgically, there was no statistically significant improvement in functional outcomes throughout illness stages as determined by the HHS. The intrinsic dangers of surgical intervention for pediatric hip abnormalities align with others, such as infections (42.9%) and non-union at the osteotomy site (28.6%).[22,23]

This study also had some limitations. Being a single center study, conducted on a relatively modest sample size, these results need further verification in large multicentric trials in the future. More studies are also needed to evaluate long term follow up evlaution and outcomes.

CONCLUSION

This study demonstrated that VDRO is an effective surgical intervention for managing Perthes disease in children, particularly in improving clinical function and promoting femoral head remodeling. Significant improvements were observed in Harris Hip Scores and radiographic indices such as Mose's Index and Stulberg Classification over the follow-up period.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
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2	**Pervez Ali:** Concept and design, interpretation.
3	**Shazia Soomro:** Data analysis, proof reading.
4	**Jagdesh Kumar:** Critical revisions.
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