

# A CONGENITAL SUBLUXATION (DISLOCATION) OF THE KNEE JOINT IN CHILDREN: A HOSPITAL BASED STUDY

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## Abstract

**Introduction:** Congenital knee dislocation is a rare disorder, and there is no consensus for treatment of neglected elderly patients.

**Materials and Methods:** This study conducted at Dept. Of Orthopaedics, VELS Medical College and Hospital from (Jan 2020 to June 2022). Eleven infants with 11 CDK were treated at our unit. Five knees were treated with serial casting, 11 knees with PQR and four knees with VYQ. Follow up averaged 24 months.

**Results:** Seven knees achieved excellent results, two knees achieved good results and two knees achieved fair results.

**Conclusion:** Total knee arthroplasty with constrained implant has proved to be an effective and considerable treatment for such chronic neglected congenital knee dislocation.

**Keywords Knee :** Congenital · Dislocation · Arthroplasty · Constrained

## Introduction

Congenital knee dislocation is a rare disorder, and there is no consensus for treatment of neglected elderly patients. In the literature, there is one case report for two chronic knee dislocations treated with total joint arthroplasty ,another one for semi constrained knee arthroplasty in the setting of a chronic knee dislocation and three more for congenital knee dislocation treated with the Kinematic Rotating Hinged knee prosthesis . Here, we will describe an unusual case of late presenting congenital knee dislocation treated with total knee arthroplasty. Congenital dislocation of the knee (CDK) is a relatively rare condition, with an incidence estimated to be 1% of developmental dislocation of the hip (DDH) [1]. It may occur as an isolated deformity, it may be associated with musculoskeletal anomalies such as DDH and clubfoot [2–4], or it may occur as part of a syndrome such as arthrogryposis multiplex congenital (AMC) or Larsen syndrome or it may occur in paralytic conditions such as meningomyelocele [1, 3].Several factors have been postulated as to the etiology of CDK. Fetal molding due to oligohydramnios or breech position was suggested by Haga et al. [5]. Abnormality of the anterior cruciate ligament was proposed by Katz et al. [6]. Quadriceps contracture was proposed by many authors to be the cause [2, 7, 8].The diagnosis is established just after birth by the typical position of knee recurvatum, and is confirmed by radiography [2, 9]. Several classification systems have been described. They are all based on the radiographic findings of the femorotibial relationship and they classify CDK into three grades: simple recurvatum, subluxation and dislocation [1, 9–11]. Ultrasonography is useful in evaluating CDK. It provides a direct view of the pathologic lesion, is painless, and is

safe. It is also useful in evaluating reduction of the joint after manipulation or surgical treatment [12].

### Materials and methods

This study conducted at Dept. Of Orthopaedics, Vels medical college and hospital from (Jan 2020 to June 2022). This was based on our observation that the range of passive knee flexion (compared to the degree of hyperextension and the femorotibial relationship on X-rays) is a better indicator of the severity of the condition, and consequently more suitable for selecting a treatment option. We therefore set the range of passive flexion as the primary criterion for our grading system; with a range of  $\leq 90^\circ$  as GI,  $30-90^\circ$  as GII and  $> 90^\circ$  as GIII. The reproducibility of the new grading system used in this study was good, with kappa values for intra observer and inter observer repeatability of 0.71 and 0.72 respectively. Patients had been unable to get treatment in her childhood due to social impossibilities. There were neither accompanying diseases and congenital anomalies nor a family history. The patient had limitation of activity while walking due to the pain and instability. The deformity and pain have worsened with time.

### Results

All children were able to walk independently before the age of 20 months, and all parents were satisfied with the outcome. Satisfaction was measured by asking the parent(s) to grade their child's condition at the final follow-up on a scale of zero to five; with "zero" meaning totally unsatisfied and "five" meaning extremely satisfied. Parent(s) who graded their child at "three or more" were considered satisfied. To evaluate our results we described a modification of the scoring system for knee function described by Ferris and Aichroth as illustrated in **Table 3**. Seven knees achieved excellent results, two knees achieved good results and two knees achieved fair results (**Table 4 and Figs. 1, 2**). All knees that achieved excellent results were GI/II and had been treated by serial casting or PQR. The only knee that underwent PQR and had a fair outcome was GIII, and apparently the decision to perform the PQR was wrong. **Table 1** also illustrates how the X-ray findings varied regarding joint congruity in the different stages of our new grading system. CDK as part of a generalised musculoskeletal syndrome as AMC or Larsen's syndrome or as a result of spinal dysraphism were excluded from the study, as they are extremely rare and definitely associated with a poor outcome. According to our grading system; five knees were GI, 11 knees were GII and five knees were GIII (see **Table 2**). There were no skin or wound complications in children who underwent PQR. One knee (pt # 1, R) that underwent VYQ developed wound breakdown and deep infection as well as a recurrence of the dislocation. Two debridements were needed, then a revision VYQ was performed 6 weeks later and a K wire was used to hold the reduction, as it was unstable even in  $140^\circ$  flexion. One knee (pt #1, L) that underwent VYQ developed wound breakdown and infection that responded to four (twice weekly) dressings and change of cast under GA. This child developed valgus deformity of both knees that was treated by a supracondylar lateral opening wedge osteotomy. The idea of the open wedge was to achieve some lengthening that would tensionize the lax medial structures and hence stabilize the knee. The valgus was corrected. This child had a fair result in her right knee and a good result in her left knee. One knee (pt #2, L) initially underwent PQR. Unfortunately, at surgery the knee was irreducible and a VYQ was mandatory. Because of the transverse incision, it was impossible to proceed directly to a VYQ, so the wound was closed, no cast was applied and a VYQ performed 8 weeks later.

Table 1: Tarek CDK grading system

Grade	Range of passive flexion	Radiology
GI	$\angle 90^\circ$	Simple recurvatum
GII	$30-90^\circ$	Subluxation/dislocation
GIII	$\searrow 30^\circ$	Dislocation

Table 2: Patient details

Pt	Sex	Age (days)	Side	Grade	Associated anomaly	Procedure	F/U (months)
1	F	30	Bil	R: III L: III	Bil HD	R: VYQ L: VYQ	24 20
2	F	36	Bil	R: III L: III	Bil HD	R: VYQ L: PQR	26 24
3	F	42	Bil	R: II L: II	Bil HD	R: PQR L: PQR	28
4	F	34	Bil	R: I L: II	Bil CV feet	R: SC L: PQR	20
5	F	56	Bil	R: II L: II	Bil HD	R: PQR L: PQR	18
6	F	62	Bil	R: I L: II	Bil HD & CV feet	R: SC L: PQR	20
7	F	5	Bil	R: I L: I		R: SC L: SC	22
8	F	130	Bil	R: II L: II	Bil HD & CV feet	R: PQR L: PQR	16
9	F	74	Bil	R: I L: II	Bil TEV	R: SC L: PQR	24
10	F	110	Bil	R: II L: II		R: PQR L: PQR	22
11	M	335	R	III	Bil TEV & R HD	VYQ	13

*HD* hip dislocation, *CV* calcaneovalgus, *SC* serial casting

Table 3: Modified knee function scoring system

Grade	Flexion (range)	Extension (power)	Instability	Pain
E	Full	G5	Nil	Nil
G	$\angle 90^\circ$	CG3	Mild	Mild
F	$45-90^\circ$	G2	Mild	Mild
P	$\searrow 45^\circ$	$\searrow$ G2	Gross	Severe

*E* Excellent, *G* Good, *F* Fair, *P* Poor

Table 4:

Pt	Range flexion	ofPower extension	ofInstability	Pain	Result	Complications
1R	0-60	G2	Mild	Nil	F	Deep infection, wound breakdown, recurrent dislocation, genu valgum
1L	0-100	G3	Mild	Nil	G	Deep infection, wound breakdown, genu valgum
2R	0-110	G3	Mild	Nil	G	Failure of PQR. VYQ 8 weeks later with recurrent dislocation. Revision VYQ done. Procurvatum, slight persistent anterior subluxation of the tibia
2L	0-60	G2	Mild	Nil	F	
3R	0-95	G3	Nil	Nil	G	Dislocation in cast with revision PQR
3L	0-100	G3	Nil	Nil	G	
4R	0-140	G5	Nil	Nil	E	
4L	0-140	G5	Nil	Nil	E	
5R	0-140	G5	Nil	Nil	E	
5L	0-140	G5	Nil	Nil	E	
6R	0-140	G5	Nil	Nil	E	
6L	0-140	G5		Nil	E	
7R	0-140	G5	Nil	Nil	E	
7L	0-140	G5	Nil	Nil	E	
8R	0-140	G5	Nil	Nil	E	
8L	0-140	G5	Nil	Nil	E	
9R	0-140	G5	Nil	Nil	E	
9L	0-140	G5	Nil	Nil	E	
10R	0-120	G4	Nil	Nil	G	
10L	0-120	G4	Nil	Nil	G	
11	0-95	G3	Mild	Nil	G	Deep infection, wound breakdown



Fig. 1: Clinical presentation of the patient



Fig. 2:

### Discussion

Patients with untreated CDK develop stiff, unstable knees. A successful surgical result is achieved with quadriceps lengthening. If the quadriceps tendon and the anterior cruciate ligament are divided, then only fair results are achieved [9]. Treatment options include serial casting, PQR [13], and VYQ [2]. Compared to PQR; VYQ is associated with increased morbidity due to a long incision with scarring, adhesions, and wound breakdown, as well as blood loss; however, it is more successful in achieving and maintaining reduction in severe and resistant cases. Laurence mentioned that the prognosis of CDK was adversely affected by delay in treatment and by the presence of other musculoskeletal deformities [7]. Most authors recommend that the knee be treated first. A good hip position cannot be maintained as long as the knee cannot be sufficiently flexed. It is also difficult to correct the equinovarus deformity of the foot caused by tension on the gastrocnemius when the knee cannot be flexed sufficiently [14]. Many modalities can be used for conservative treatment, including the use of serial casting to increase knee flexion, the Pavlik harness for posturing of the knee in further flexion, skin traction, and skeletal traction [6, 9, 15]. Haga et al. suggest that it is advisable to wait 1 month for spontaneous reduction of CDK in cases not associated with clubfoot, AMC, or Larsen's syndrome [5]. These different opinions make the treatment of CDK confusing. Injury of the proximal tibial physis is a recorded complication of forceful manipulation in CDK. This might result in premature closure of the posterior part of the physis, with resultant tibial procurvatum [1, 5]. Genu valgum is a common complication of CDK, especially with severe grades that have been treated by VYQ. It is disabling, and is best treated by an opening wedge supracondylar osteotomy [16]. In a study by Bensahel et al. [17], 56 CDK were studied. Leveuf classification was used (GI = simple hyperextension, GII = subluxation, GIII = complete dislocation). Six knees were GI, 21 knees were GII and 29 knees were GIII. Twenty-four knees were treated conservatively (three GI, 6 GII, 15 GIII). VYQ was performed on 32 knees (three GI, 15 GII, and 14 GIII). The study concluded that there was no strict parallelism between the amount of joint displacement at onset and the operative indication. In a study by Bell et al. [18], nine cases of CDK were included in the study. It was not possible in any case to flex the knee beyond zero degrees of extension. All knees demonstrated at least 45° hyperextension deformity. All knees had failed to respond to conservative measures (serial manipulations and plasters). All knees underwent VYQ. Excessively vigorous attempts to correct the dislocations were felt to be inadvisable because of the danger of damaging the epiphyses or the articular surfaces [1]. The patients were

examined to determine the range of knee movement, stability, power of extension, and functional ability. The mean follow-up was for 24 months. All the patients were able to walk. An extensor lag of up to 30° was present in all patients except one. All the knees were stable, except one which had a positive anterior drawer sign. The quadriceps power in all cases was Grade 4 or greater. Flexion of 75° or more was achieved in eight of the nine knees. In a study by Mehrafshan et al. [19], 45 patients with 68 CDK were treated. Conservative treatment was initially performed. If failed VYQ was undertaken. Final outcome was excellent/good in 90% and fair in 10% in group I (reducible). In group II (recalcitrant), 70% had good, 12% had fair, and 18% had poor results. In group III (resistant), 36% had fair and 64% had poor results. They concluded that the absence of anterior skin fold, knee flexion  $\geq 50^\circ$ , irreducible dislocation at first physical examination, and positive family history are predictive factors for poor results

### Conclusion

During the 2.5 years of follow-up, our patient has been pain-free with efficient functional outcomes. There are no radio-logical and clinical signs of loosening. Total knee arthroplasty with constrained implant has proved to be an effective and considerable treatment for such chronic neglected congenital knee dislocation.

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