Study of patients treated for congenital dislocation of the knee with V-Y quadricepsplasty and capsulotomy and K wiring

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Abstract
Background: Congenital dislocation of the knee is a rare congenital anomaly. We were fortunate to have significant number of this patients. This study was undertaken to evaluate the result of surgical management of congenital dislocation of the knee.

Method: In this study total 12 patients (19 knees) were included. We compare this study with BELL, Atkins & Sharrard series on the basis of age, sex, pattern of involvement, birth order, birth presentation, associate deformity and syndrome, range of movement. Our average follow up was 3 year and 8 months.

Result: In this study 15 knees (78.95%) had good result and 4 knees had fair result (21.05%). In our series all 12 patients had ability to walk among which 8 patients were community walker and 4 patients were household walker. In our study only 1 patient (1 knee) had wound gaping (5.26%).

Conclusion: Most of the patients presented at late stage requiring higher chances of surgery. If patients are referred at early age, there is possibility of treatment with plaster and decreasing need of surgery. Patients of idiopathic knee had good result then syndromic knee.

Keywords: congenital dislocation of the knee (CDK), Arthrogryposis multiplex congenital (AMC)

Introduction
Congenital dislocation of the knee is a rare congenital anomaly. It varies from simple hyperextension of the knee to complete dislocation of the tibia on the femur. Simple hyperextension is treated by cast and splint while complete dislocation is difficult to treat and requires complex surgery. Even after surgery knee does not become completely normal. The exact etiology remains unknown. It has been associated with certain factors including abnormal foetal position, Primary contracture of the quadriceps muscles, traumatic dislocation during parturition, Absence or hypoplasia of the cruciate ligaments, Lack of intrauterine space, Lack of amniotic fluid. Congenital dislocation of the knee is commonly associated with disorders like Arthrogryposis multiplex congenita, Larsen’s syndrome, Down’s syndrome etc. This study was undertaken to evaluate the result of surgical management of congenital dislocation of the knee.

Congenital dislocation of the knee is obvious deformity at the time of birth with hyperextension of the knee. Dimple or deep crease may be present over the anterior aspect of the knee. The patella is difficult to palpate. Congenital dislocation of the knee is usually associated with DDH (45%) and foot deformity (31%) [10]. Surgery is reserved for cases of failed conservative treatment or cases who present late, say after one year of age and options include VY Quadricepsplasty, capsulotomy and k wiring. Bracing is used as adjunct to maintain reduction. We aim to review long term result after surgery at our institution.

Materials and Method
Our study was performed from April 2013 to April 2019 at the department of orthopaedics civil hospital and ZMCH Dahod. The average follow up period was 3yr and 8 month. There were 12 patients (19 knees) in which 8 male and 4 female patients. IN 8 patients 5 bilateral knee and 3 single. IN 4 female patients 2 bilateral and 2 single knee. 6 patients had AMC and 6 had idiopathic CDK.
Birth history, birth presentation, family history, types of previous treatment, associate anomaly and ROM of the knee included. X-ray and photographs of all the patients were taken at the time of admission, during surgery and during follow up. These were used to classify the deformity and to see how much improvement in patients. We classify the CDK using Leveuf and pais (1947) Classification. Describe congenital dislocation of the knee into three types.

In Grade I or congenital hyperextension of the knee: Knee flexion is easily possible and reduction is achieved with gentle stretching of the quadriceps. In Grade II or congenital subluxation of the knee: Knee flexion is not possible beyond neutral but the femoral and the tibial epiphyses are in contact and do not subluxate when flexion is attempted. In Grade III or true irreducible congenital dislocation of the knee: Knee flexion is not possible and the tibia which is anteriorly translated in the resting position may displace laterally on the femur when more vigorous flexion is attempted. In our study all 19 knees were dislocated.

These cases were operated by me and my assistant orthopaedic surgeon. Anaesthesia was decided by consultant anaesthetist. Preoperative antibiotics were given. Curtish and Fisher (1969) described a procedure for correction of congenital dislocation of the knee that is recommended for children of 6 to 8 months old.

In our institute for congenital dislocation of knee, capsular release and V-Y quadricepsplasty and K-wiring is done.

**Technique:** Make a long midline anterior incision starting at the level of the middle third of the femur to the tibial tuberosity.

Expose the anterior thigh muscle and divide the quadriceps mechanism Superior to the patella by long inverted `V' shaped incision. Adhesion between Vastus, patella and femur is removed. Lateral capsulotomy is done and preserving hamstrings and popliteal tendon. Knee is flexed for inspection of the menisci and cruciate ligament.

In 60° flexion of the knee, K-wire is inserted from medial side of proximal tibia and pierces the lateral cortex of lower end femur.

Suture the lengthened quadriceps mechanism in ‘Y’ shape by repair of the vastus medialis to the lengthened rectus femoris. Close the wound after haemostasis then bend K-wire and apply long leg cast with the knee flexed up to 60°.

**Fig 1:** After the inverted V shaped incision of quadriceps mechanism, adhesion removed and lateral capsulotomy done, in 60° flexion of the knee K-wire inserted then suturing of the lengthened quadriceps mechanism in ‘Y’ shape by repair of the vastus medialis to the lengthened rectus femoris.

After 3 weeks, cast is changed and K-wire is removed and second cast is given with knee in 90° flexion for 3 wks then AK-BK splint in 90° flexion is given for 2-3 months after that night splint is given for 2-3 months and knee exercises are started.

**Result**

At final follow up, 15 knees (78.95%) had good result and 4 knees had fair results (21.05%). All 12 patients had ability to walk among which 8 (66.67) patients were community walker and 4 patients (33.33%) were household walker. Only 1 patients had wound healing complication.

Functional outcome assessed by following criteria.

**Criteria for result of congenital dislocation of the knee**

|                    | Good | Fair | Poor |
|--------------------|------|------|------|
| Flexion            | >90° | 46°-90° | 0°-45° |
| Extension lag      | <5°  | 5°-10° | >10° |
| Quadriceps power   | >4°  | 3°-4° | <3°  |

**Observation and Analysis**

1. **Sex distribution**

| Sex      | Present Series | Bell, Atkins & Sharrard Series | P value |
|----------|----------------|--------------------------------|---------|
|          | No. of Patient | Percentage (%)                  | No. of Patient | Percentage (%) | 0.50 |
| Male     | 08             | 66.67                          | 04            | 80.00          | p>0.05 |
| Female   | 04             | 33.33                          | 01            | 20.00          |       |
| Total    | 12             | 100.00                         | 05            | 100.00         |       |

In our series M: F ratio was 2:1 with male predominance. In Bell, Atkins & Sharrard Series M: F ratio was 4:1. Relation of CDK with age was not significant. (p>0.05)

2. **Birth Presentation**

| Birth presentation | Present Series | Bell, Atkins & Sharrard Series | P value |
|--------------------|----------------|--------------------------------|---------|
|                    | No. of patient | Percentage (%)                  | No. of patient | Percentage (%) | 3.39(p>0.05) |
| Vertex             | 07             | 58.33                          | 04            | 80.00          |       |
| Breech             | 05             | 41.67                          | 01            | 20.00          |       |
| Total              | 12             | 100.00                         | 05            | 100.00         |       |

In our study 58% had breech presentation which compared to normal average of 3-4% which was significant.42% had vertex presentation. In BELL, ATKINS & SHARRARD series 80% had breech presentation and 20% had vertex presentation. This was statistically not significant. (p>0.05)
3. Type of Delivery

| Type of delivery | No. of patient | Percentage (%) |
|------------------|----------------|----------------|
| Vaginal          | 05             | 41.67          |
| Cesarean section | 07             | 58.33          |
| Total            | 12             | 100.00         |

In our series seven patients had breech presentation with C/S (58.33%) and 5 patients had vertex presentation with vaginal delivery (41.67%).

4. Previous Treatment

| Previous treatment taken | No. of knee | Percentage (%) |
|--------------------------|-------------|----------------|
| Yes                      | 08          | 42.10          |
| No                       | 11          | 57.90          |
| Total                    | 19          | 100.00         |

In our series 42% knee were treated previously at other hospital or institute in form of manipulation or plaster.

5. Age When Treatment Started

| Age when treatment started by author | No. of Patient | Percentage (%) |
|-------------------------------------|----------------|----------------|
| 0-1 month                           | 04             | 33.33          |
| 1-6 month                           | 05             | 41.67          |
| 6-12 month                          | 02             | 16.67          |
| >1 yr                               | 01             | 8.33           |
| Total                               | 12             | 100.00         |

In our series treatment of 9 (75%) patients started within 6 month of life in which 33.33% in first month. Late presentation of patient had required higher chances of surgical treatment.

6. CDK – Idiopathic & Syndromic

| CDK            | No. of patient | Percentage (%) |
|----------------|----------------|----------------|
| Idiopathic     | 06             | 50.00          |
| Syndromic      | 06             | 50.00          |
| Total          | 12             | 100.00         |

In our series 50% of patients Of CDK were syndromic (associated with AMC). 50% of patients of CDK were idiopathic.

7. Associated Deformity (DDH & CTEV) In AMC & Non AMC

| CDK associated with | DDH | CTEV |
|---------------------|-----|------|
| AMC                 | 04  | 80.00|
| NON AMC             | 01  | 20.00|
| Total               | 05  | 100.00|

In our study 4 patients with AMC had DDH and 1 patient not associated with AMC had DDH. 5 patients with AMC had CTEV.

8) Type of Dislocation

| Type      | No. of knee | Percentage (%) |
|-----------|-------------|----------------|
| Subluxation | --         | --             |
| Recurvatum | --         | --             |
| Dislocation| 19         | 100.00         |

In our study all 19 knee (12 patients) had ant. dislocation and required surgery.

9. Complication

| Complication          | Present Series | Bell, Atkins & Sharrard Series | P value |
|-----------------------|----------------|--------------------------------|---------|
|                       | No. of knee | Percentage (%) | No. of patient | Percentage (%) | |
| Wound infection       | 00         | 00.00          | 00             | 00.00          | 0.52 |
| Wound gaping          | 01         | 5.26           | 02             | 22.22          | (p>0.05) |
| Others                | 00         | 00.00          | 00             | 00.00          |         |

In our study only 1 knee (case no. 10) had wound gaping. In follow up patient had good result. In BELL, ATKINS & Sharrard series 2 knees (22.22%) had wound gaping. This was statistically not significant. (p>0.05)

10) R.O.M

Flexion

| Flexion | Present Series | Bell, Atkins & Sharrard Series | P value |
|---------|----------------|--------------------------------|---------|
|         | No. of knee | Percentage (%) | No. of patient | Percentage (%) |         |
| 0°-15°  | 09         | 52.63          | 09             | 47.37          | 0.79 |
| 15°-90° | 09         | 47.37          | 09             | 52.63          | (p>0.05) |
| >90°    | 00         | 00.00          | 00             | 00.00          |         |
| Total   | 19         | 100.00         | 19             | 100.00         |         |

In our study flexion was in between 0°-120°. Average flexion was 85°. In study of BELL, ATKINS & Sharrard flexion was ranging from 0°-150° and average flexion was 95°. When compared, this was statistically not significant. (p>0.05)

Extension Lag

| Extension lag | Present Series | Bell, Atkins & Sharrard Series | P value |
|--------------|----------------|--------------------------------|---------|
|              | No. of knee | Percentage (%) | No. of patient | Percentage (%) |         |
| ≤5°          | 10         | 52.63          | 02             | 22.22          | 0.68 |
| 5°-10°       | 09         | 47.37          | 03             | 33.33          | (p>0.05) |
| >10°         | 00         | 00.00          | 04             | 44.45          |         |
| Total        | 19         | 100.00         | 09             | 100.00         |         |

In our series extension lag was in between 0°-15° and average extension lag was 3°. In study of BELL, ATKINS & Sharrard extension lag was in between 0°-30°and average extension lag was 14°.

11. Quadriceps Power

| Quadriceps Power | No. of knee | Percentage (%) |
|------------------|-------------|----------------|
| 5                 | 05          | 73.68          |
| 4                 | 05          | 26.32          |
| ≤3                | 00          | 00.00          |

In our study quadriceps power of all knees were 4 to 5 (100%) similar to study of Bell, Atkins & Sharrard.
Conclusion
Congenital dislocation of the knee is a rare congenital anomaly. We were fortunate to have significant number of patients with this rare anomaly. In our series 50% of patients (6) were arthrogrypotic. Higher incidence of breech presentation with P value=0.02(p<0.05), suggest that breech presentation is probably a contributing factor for congenital dislocation of the knee.

Most of the patients presented at later age requiring higher chances of surgery. If patients are referred at early age, there is possibility of treatment with plaster and decreasing need of surgery.

DDH (41.67%) and CTEV (41.67%) were more common in arthrogrypotic patients than idiopathic. Rate of wound complication was low (5.26%) in our series, this was due to meticulous surgical technique.

All our patients had ability to walk. Patients of idiopathic CDK had good range of movement but a chance of surgery. If patients are referred at early age, there is possibility of treatment with plaster and decreasing need of surgery.

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