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Outcome Analysis of Neglected Musculoskeletal Injuries of Knee

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Abstract:
Background: *Old unreduced dislocations of knee are relatively uncommon in adults but in our hospital we have seen many cases presenting with neglected knee dislocation and neglected distal femur fractures, fracture of patella and fracture of proximal tibia with a minimum period of neglect of 1 week. Due to the increased need for restoration of the normal knee in Indians we have attempted to devise a strategy for treatment of these neglected injuries to produce the best outcome possible for the patient.*
Materials and Methods: *17 patients with neglected injuries around knee joint were selected based on a set criteria and was put on a treatment protocol according to various factors like age, outcome expected, occupation of the patient etc and they evaluated at three stages pre intervention, intervention and post intervention stage. Then after a serial follow up period of minimum 1 year the final outcome was recorded.*
Results: *In our study neglected trochanteric fractures had a better outcome when compared to neglected neck of femur that underwent fixation of fractures. In neck of femur fracture that underwent prosthetic replacements had better outcome than fracture fixations of neglected neck of femur fractures*
Conclusion: *In conclusion we have proven that irrespective of duration of neglect surgical procedures for neglected injuries are always better than watchful neglect. The complications and outcome in all the cases depended on many factors as even in some cases with longer neglect duration excellent outcome was possible but in some cases with shorter neglect duration also fair outcome was only possible.*
Keywords: *Knee Injury, Neglected Injury, Distal femur, Proximal tibia, Knee dislocation, Patella*

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I. Introduction

Musculoskeletal injuries are major causes of death and disability all over the world, especially in a developing country like India[1]. There is increased incidence of trauma induced musculoskeletal injuries due to various factors like increased usage of motorized vehicles in combination with bad roads[2], accidental farm injuries or workplace injuries, fractures following trivial fall especially in geriatric population and associated co-morbid conditions. Musculoskeletal injuries following trauma is part of a spectrum of musculoskeletal disorders which has become a rising epidemic in a country present in developing stage like India3. These disorders as part of Non-communicable diseases1 are responsible for heavy economic burden on a developing nation[3].Neglected knee injuries are relatively rare as this is an important weight bearing joint. The injuries involving the knee joint include isolated dislocations, distal femur fractures, fracture of patella and fracture of proximal tibia. Out of the dislocations 40% are anterior, 33% posterior and 5% rotatory mechanism.The most common findings synonymous with neglected knee injuries are extensive ligament disruption and contracture, infection, heterotopic ossification, chondrolysis of unreduced knee cartilage, stiffness, deformities, discrepancy in limb length and osteopenia.These complications have to be treated in a stepwise pattern to restore near normal anatomy and functional capacity as this is an important joint to ensure good quality of life.
The goals of treatment in case of neglected knee injuries are:

- Reconstruction of articular surface
- Re-establishment of tibial alignment

Treatment usually involves:

- Reduction and buttress plating of disrupted articular segments by grafting with bone.
- Soft tissue reconstruction including menisci and ligaments.
- Spanning external fixator as a temporary measure in patients with high energy injuries or significant soft tissue injury
- Arthroscopy

Flexion 0°-90° is acceptable and in some cases flexion of 5^0-$120^0$is found to give satisfactory functional life for the patients.As these injuries getting neglected is a very rare phenomenon, literature search has provided with only case report studies.

II. Materials and methods

This study, which is a prospective and retrospective study, was conducted after getting approval from Institutional Ethical Committee. This study was conducted during the period of January 2015 to December 2015.615 patients from Institute of Orthopedics & Traumatology Rajiv Gandhi Government General Hospital, Chennai were selected based on set criteria. All patients were selected after getting informed consent. The criterion for their selection was based on the following:

- All patients with periarticular fractures, fracture dislocations and isolated dislocations of knee joint

Criteria for selection of neglected cases:

- **Age 14- 60 years**

According to the policy of Indian Academy of pediatrics children up to 13 years are treated by pediatric specialists and for more than 14 years they are treated as miniature adults in general hospital. The age limit for geriatric population starts from 65 years. As the orthopedic management of these extremes is incomparable we have chosen to take the median group for our study.

- **Both gender**
- **Injury to intervention interval – 1 Week**

As patients from remote areas with poor accessibility, despite being aware of the need for an orthopedic specialized care for their injury, the time for them to reach the center highly varies. Hence we have set an inclusive period of 1 week and more as neglected period from previous experience and hospital data.

- **History of neglect of injury due to various reasons**

They were evaluated based on:

History of patient annexure:

To include detailed history on nature and cause for injury, orthopedic complaints immediately post injury and at present, treatment opted if any and detailed study about the modality of treatment and outcome of previous treatment, duration of neglect, urban or rural nativity, occupation and its nature whether heavy moderate or light and associated co morbid conditions.

Questionnaire annexure

A screening questionnaire was devised to acquire a detailed knowledge about the cause for neglect and the reasons behind it and also to examine the interlinked relationships between these causative factors. The questionnaire it also included the details about reason for opting for tertiary care now and the outcome that the patient expects.

Clinical examination annexure

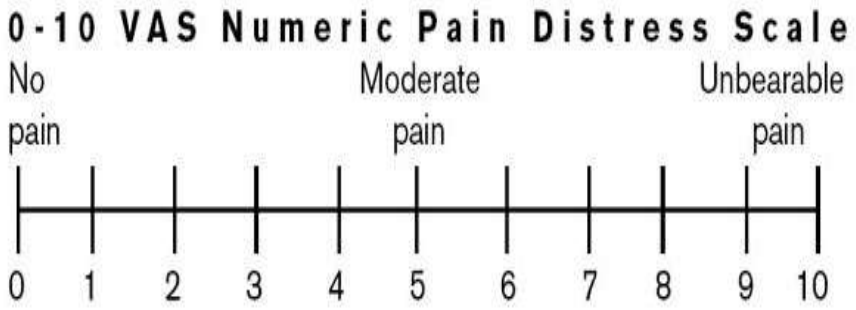
On presentation the patient's full clinical examination was done according to proforma specific to each case based on the joint involved. Details of the limb on inspection, palpation and range of movement possible and neurological examination were noted.

Visual analog scale

Visual analog scale is a system of psychometric scale based on patient response for analysis of pain. The reliability is widely tested and it is proven to be able to determine acute as well as chronic pain.

The scale was in the form of a 100mm line with markings from 0 to 10 at regular intervals of 10mm. The two extremes were marked as - minimum pain at 0 and maximum pain at 10.

The patients with altered mental status and diminished visual acuity were excluded. Then they were asked to point in the scale the level of pain due to their neglected injury. This evaluation was done pre and post procedure and then compared to find the difference.



Functional evaluation

- Moderately to poorly affected daily activity, household activity, and work place activity

Radiological evaluation

- **Digital X ray**
- Digital Xray was taken in antero-posterior and lateral views and special views for specific cases as needed. They showed the alignment of the limb, articular surfaces, soft tissue shadows, Myositis ossificans, radiological, callus and deformity, if present is noted. Opposite limb normal Xray was taken in Anatomical position and the degree of deformity was noted in template for correction of affected limb.

Intervention:

The intervention mode planned for the patients were based on
Age
Limb involved
Functional needs

Follow up treatment protocol

General postoperative protocol followed was:

- Patient customized
- Parenteral Antibiotics therapy were given for 5 days to 1 week
- Indomethacin was started in all the cases on 1st postoperative day and was continued for 2 weeks.

The joint specific protocol followed is as follows:

Post Follow Up Functional Evaluation Post Follow Up Functional Evaluation

All patients were further evaluated at the end of last follow up with pre-validated, specific, functional evaluation scoring system.

- Knee joint- Bostman knee score

Knee joint:

17 cases were admitted during our study period. Of which 15 cases were natively treated and 1 case reported to our hospital without any treatment because of poor accessibility from his area of residence and 1 more case because of neglect due to mental illness.

Pre-intervention stage:

Neglected injuries are very rarely reported as it is associated with severe pain and disability which forces the patient to seek immediate attention. Despite this we had reported 17 cases of periarticular knee injuries. The patients presented with stiff knee or unstable knee, and the stiff knee severity depended on native treatment opted and the period of rigid immobilization undergone. They also had history of poultice wrapping, massage sessions, and forceful manipulations done on them. The patients were assessed clinically and were found to have severe restriction in range of motion. The radiological assessment included antero-posterior and lateral views. CT scan was taken in all cases to confirm the pattern of fracture.

Intervention stage:

Intraoperatively the reduction was difficult and required soft tissue release**.** The sclerotic edges of fracture were removed and temporarily fixed with K wires and reduction clamps and then plate osteosynthesis was done for 12 cases of tibial plateau and supracondylar femur fractures[4-6, 7-10]. Out of them 6 cases needed bone grafting procedure. There were 4 patella fractures for which modified tension band wiring was done [11-

[12]with or without circlage. 1 case of head of fibula fracture needed common peroneal exploration, as the patient presented with foot drop.

Table 1: Diagnosis and procedure done for neglected injuries involving Knee joint

Case no.	Diagnosis / duration of neglect	Procedure done
1	Supracondylar Fracture femur with tibial spine avulsion right side / 1 week	Open reduction and internal fixation with distal femur locking compression plate
2	Left patella fracture / 16 weeks	Modified tension band wiring with bone grafting
3	Supracondylar fracture left femur / 1 week	Open reduction and internal fixation with distal femur locking compression plating and bone grafting
4	Proximal tibia fracture right side / 3 weeks	Open reduction and internal fixation with medial column proximal tibia Locking compression plate
5	Left patella fracture / 1 week	Modified tension band wiring
6	Fracture nonunion right patella / 8 weeks	Modified tension band wiring with bone grafting
7	Fracture nonunion distal right femur / 24 weeks	Open reduction and internal fixation with distal femur locking compression plate with bone grafting
8	Right tibial plateau fracture / 1.5 weeks	Open reduction and internal fixation with bicolumn proximal tibia locking compression plating
9	Supracondylar fracture right femur / 3 weeks	Open reduction and internal fixation with distal femur locking compression plate with bone grafting
10	Comminuted fracture right patella / 4 weeks	Patella circlage with loose fragment removal
11	Medial condyle fracturefemur with tibia lateral condyle fracture with patella fracture right side / 24 weeks	Open reduction and internal fixation with buttress plating for medial condyle femur and lateral condyle tibia with patella circlage
12	Bicondylar fracture with tibial plateau fracture right side / 3 weeks	Open reduction and internal fixation with bicolumn proximal tibia locking compression plating
13	Supracondylar fracture right femur / 1week	Open reduction and internal fixation with distal femur locking compression plate with bone grafting
14	Comminuted Supracondylar fracture left femur / 2 weeks	Open reduction and internal fixation with distal femur locking compression plate with bone grafting
15	Head of fibula fracture with foot drop / 32 weeks	Open exploration of common peroneal nerve and resection of fibula head
16	Left patella fracture / 3 weeks	Modified tension band wiring
17	Right supracondylar fracture / 36 weeks	Open reduction and internal fixation with distal femur locking compression plate with bone grafting

Post-intervention stage:

In distal femoral fractures,ranges of motion exercises were started on 2nd postoperative day. Weight bearing was allowed only after the consolidation of fractureoccurred. In knee injuries, posttraumatic quadriceps contracture is an important disabling factor which needed intra operative knee mobilization and arthrolysis in most cases with increased duration of neglect.In tibial plateau fractures the knee was placed in posterior splint for a period of 3 to 4 days after which removal of splint was done and range of motion exercises were begun. Non weight bearing in selected cases were advocated in case of unsatisfactory reduction even up to a period of 16 weeks. In patella fractures, weight bearing was allowed as early as possible.Bostman knee Score is used commonly to analyze the outcome of surgeries of the hip and to evaluate various hip disabilities and the modalities of treatment in adults.

Table 2: Bostman knee score

Parameter	Score
Range of motion Full extension range of motion > 120	6

Full extension 90-120	3
Pain No pain or minimal pain with activity requiring exertion	 6
Moderate pain with activity requiring exertion	3
Pain during daily activities	0
Work Regular job Alternate job Not possible to work	 4 2 0
Atrophy of affected limb <12mm 12-25mm >25mm	 4 2 0
Walking No assistance needed Cane assistance part time Cane assistance full time	 4 2 0
Joint effusion None Patient reported the presence Presence confirmed	 2 1 0
Instability /giving way None Sometimes Daily life	 2 1 0
Stair climbing Normal Difficult Not possible	 2 1 0

Table 3: Grading system for Bostman knee score

Grade	Score
Excellent	30-28
Good	27-20
Unsatisfactory	<20

Exclusion criteria

The following cases were excluded from the study as they might alter the outcome of the study.

- Intra articular fractures
- Physeal injuries
- Polytrauma patients
- Grossly contaminated open injuries
- Injuries of the spine
- Implant/prostheses failures

Statistical analysis:

Statistical analysis was done using SPSS software version 17. Mean and standard deviation for age, duration of neglect, scoring systems, visual analog scale pre and post procedure and post follow up was done. Comparison studies were done with confidence interval 95% and $p<0.05$. Descriptive statistics were applied and frequency distribution was found for each joint parameter under evaluation. Sample proportion for neglected cases was determined.

III. Results

This prospective and retrospective study done during the period of January 2015 to December 2015 provided us with a large data of cases with joint injuries who came to our hospital including the patients who had come immediately after injury and also patient who had come after period of delay/neglect. This data was used to determine the extent of neglected musculoskeletal injuries around the major joints present in our society as a non-communicable disease. As the patients visiting our General Hospital were from Chennai and surrounding urban and rural areas this data could provide valuable insight regarding the neglected musculoskeletal injuries in our State of Tamil Nadu, Pondicherry Union Territory as well as neighboring States of Seemandhra, Telengana and Karnataka.

Knee joint outcome analysis

17 cases had been admitted in our hospital with injuries involving knee joint. There were 13 male patients and 4 female patients in our study. 9 patients were from urban area and 8 patients were from rural areas. Out of the total cases 14 were natively treated, 2 patients had not undergone any treatment before coming to our hospital and 1 patient, who had history of mental illness, had been neglected because of lack of care givers. The period of neglect ranged from 1 to 36 weeks and mean±S.D was 9.61±11.94. The pre procedure VAS mean± S.D was 7.88±0.92. The post procedure VAS mean± S.D was 1.35±0.86. At the end of follow up of 1 year the functional range of motion achieved was satisfactory. The mean functional range of motion is given in table 29. The outcome was excellent in 9 cases, good in 4 cases and fair in 4 cases. The mean functional score was 26 and the overall outcome was good.

Table 4: Post intervention functional range of motion of knee joint

Cases	Flexion
Mean± S.D	60 ± 0.88

Table 5: Pre and Post procedure evaluation for neglected injuries involving knee joint

Case no.	Age/gender	Duration of neglect (in weeks)	Pre-procedure VAS	Post-procedure VAS	Follow up (in months)	Functional score
1K	40/M	1	9	2	12	Good (25)
2K	40/F	16	6	1	12	Excellent (29)
3K	58/M	1	9	1	12	Excellent (28)
4K	60/M	3	7	1	12	Excellent (28)
5K	50/F	1	9	1	12	Excellent (29)
6K	54/M	8	8	2	12	Good (24)
7K	25/F	24	7	2	12	Good (24)
8K	47/M	1.5	8	0	12	Excellent (29)
9K	21/M	3	8	1	12	Good (25)
10K	60/F	4	8	3	12	Good (22)
11K	40/M	24	7	2	12	Unsatisfactory (19)
12K	41/M	3	8	1	12	Excellent (29)
13K	45/M	1	9	1	12	Excellent (28)
14K	30/M	2	9	3	12	Good (23)
15K	20/M	32	7	0	12	Excellent (29)
16K	60/M	3	8	1	12	Excellent (28)
17K	22/M	36	7	1	12	Good (25)

Summary Of Findings

Parameters	Knee
Total neglected cases	17
Period of neglect mean±S.D	9.61±11.94
Pre procedure VAS mean±S.D	7.88±0.92
Post procedure VAS mean±S.D	1.35±0.86
Functional score mean	26
Outcome mean	Good

V. Discussion

The result of our study has proven that neglected musculoskeletal injuries are a persisting epidemic in our country. Our study has shown that 28% of injuries to the major joints reported to our General hospital were neglected. The period of neglect included in our study ranged from 1 week to maximum 190 weeks. The main cause of neglect found in our study was due to native treatment, the percentage of which was 80%. Among those who were admitted in our hospital, 63% of them were males and 59% were from rural areas. The neglected injuries of the lower extremity were more common than the neglected injuries of the upper extremity. The hip joint was the most common joint where the injuries were neglected; especially in the age group of 54-60 years. The cause was found to be due to lack of awareness and proper care to self with increasing age. We observed a trend of increasing magnitude of neglected injuries with increase in age.The native treatment is found to be significantly prevalent in our part of the country. In our study group we encountered wide spectrum of modes of native treatment, the most common was the treatment under the name of "puthurkattu". Out of the 80% of the study group who had opted for native treatment 41% belonged to rural areas and 39% belonged to urban areas. This marginal difference shows that inspite of the accessibility and wide availability of orthopedic specialty care centers the prevalence of native treatment induced complications is high in urban areas. This trend shows that there is ignorance and deep rooted false belief in the minds of our people irrespective of the area in which they reside. This has to be addressed first by health education and spreading awareness among the people. This marks

the first step in the primordial prevention of neglected musculoskeletal injuries. In a few cases the reason was purely financial, where native treatment was a cheaper alternative. This has been rectified at present in the form of Chief Minister's health insurance scheme practiced in our state of Tamil Nadu, which has encouraged the patients to seek medical attention immediately.

Knee joint outcome analysis

Some of the case report discussions and their outcome are described below.Khamaisyet al [13]studied a case of neglected rotatory tibio-femoral dislocation associated with lateral patella dislocation of 3 years duration of neglect. The patient underwent multiple procedures including Ilizarov, and tibial tubercle osteotomy. Post a 9 year follow up period the patient showed good outcome.Henshawet al[14]studied a case of unreduced posterior dislocation of 24 weeks neglect duration. The procedure done was open reduction and internal fixation. After a follow up period of 22 weeks the patient had satisfactory result.Mathaiet al[15] studied a case of unreduced anterior dislocation of knee with common peroneal nerve palsy. The procedure done was arthrodesis with Dynamic compression plating. The patient was followed up for 2 years. Modified knee society score of 65 out of 75(25 points for ROM was not taken into account) was seen at the end of 2 years.

Karnet al [16]studied a case of anterior dislocation with neglect duration 4 weeks. The patient underwent open reduction and internal fixation. After a period of 1 year follow up the outcome was satisfactory with range of motion of 5°-70° attained.Guillen et al studied a case of knee injury with bayonet deformity, secondary equinus deformity of foot with peroneal nerve palsy neglected for 50 years post disease at 5 years of age. The patient had sustained systematic treatment for her deformity correction that included external fixator application, progressive reduction and arthrodesis. After a 1 year follow up period the patient had slight limitation of everyday activities but enjoyed a great deal of subjective satisfaction.Raj et al studied a case of 8 months old neglected intra articular proximal tibia fracture and post-surgical reduction and at the end of 1 year the patient showed good functional outcome.ainiet al[17] studied a case of 3 month old neglected irreducible posterolateral knee dislocation. The procedure done was open reduction and PCL reconstruction and other adjuvant procedure based on intra operative findings. The patient was followed up for 3 years and Knee society clinical and functional Knee scores were 88 and 90 respectively.

Chen et al[18] studied a case of unreduced posterior dislocation with advanced osteoarthritic changes with duration of neglect of 30 years. This patient underwent multiple stepwise procedures and at the end of 2 years had good outcome.

Devganet al [19]conducted a case series study of 3 patients with old medial tibial plateau fracture with non-union. They were treated by a minimally invasive technique of high tibial osteotomy and realignment procedure. With physiotherapy and exercises the cases achieved union and satisfactory results.Anandet al[20] studied 12 cases of malunion of intra articular tibial plateau fracture with duration of neglect ranging from 3 to 12 months. The procedures performed were patient tailored; they ranged from corrective osteotomy to reconstruction surgeries fixative surgeries and also bone grafting. After a mean follow up of 54 months the patients were evaluated using Lysolm scoring system and the reports were excellent in 5 cases, good in 5 cases, and fair in 2 cases.Jiang et al[21] studied a 27 years old nonunion Hoffa fracture and incongruence of medial condyle. Open surgical procedure with internal reduction and deformity correction with xenograft bone graft and screw fixation for fracture fixation was done. After 1 year follow up patient showed satisfactory results with full weight bearing and no instability with ROM 0°-125°.Thus these studies have proven that, irrespective of the duration of neglect, by stepwise patient tailored procedures and careful follow up satisfactory functional restoration is possible for neglected injuries involving knee joint.Neglected injuries of the knee though are rare we reported 17 cases in period of 1 year itself. All of them had undergone native treatment. We were able to get god outcome overall till a neglect period of 32 weeks. And one case showed fair outcome in spite of 2 weeks of neglect period due to implant associated infection.

VI. Conclusion

In conclusion we have proven that irrespective of duration of neglect surgical procedures for neglected injuries are always better than watchful neglect. The complications and outcome in all the cases depended on many factors as even in some cases with longer neglect duration excellent outcome was possible but in some cases with shorter neglect duration also fair outcome was only possible. Hence the commonly found factors that can influence the outcome of the neglected musculoskeletal injuries in pre intervention stage were:

- Age of patient
- Type of native treatment availed
- Duration of native treatment methods
- Quality of native treatment methods
- Associated co morbidities

- Associated fractures

The factors which influence the outcome in intervention and post intervention stage were:

- Intra operative findings of soft tissue distortion and loss of anatomical configuration
- Type of procedure selected
- Asceptic precautions taken
- Patients' will for functional betterment
- Expertise of the surgeons
- Regularity in visiting the hospital for physiotherapy

In our study all the patients had a common will for betterment and they cooperated in all the steps and thereby had a successful outcome at the end of follow up. Hence patients' cooperation and perseverance is the foremost quality that defined success for them.

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