Original Article

Deformity Correction of Lower Extremities by Application of Ilizarov

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ABSTRACT

OBJECTIVE: To assess the osteotomy results and application of Ilizarov to lower limb deformities.
METHODOLOGY: This case series study on twenty-three patients of either sex was conducted in Akbar Medical Center Peshawar from November 2016 to April 2021. The ages of the patients were ten and above. To reduce the bias, we have excluded patients with diabetes mellitus, patients on oral anticoagulants, tobacco addicts and those on steroid or immunocompromised patients. Preoperatively, the deformity was calculated to determine how long it would take to correct, so double the time was required to consolidate the callus at the corticotomy site when it was corrected. So, some frames were removed early while others were removed late. All the data were collected with the help of a proforma and then entered into SPSS version 20 for analysis.
RESULTS: There were 23 patients, nine males (39.1%) and fourteen females (60.9%). The mean age was 19.39, the minimum was 10, and the maximum was 40 years. Both sides were involved 6(26.1%) in while right 9(39.1%) was involved in and left 8(34.8%) in cases. Site of deformity was ankle in 4(17.4%), femur in 4(17.4%), knee in 8(34.8%) while tibia was involved in 7(30.4%) cases. A single osteotomy was done in 16(69.6%) cases, while a double osteotomy was done in 7(30.4%) cases due to the CORA being calculated in two places. Ten (43.5%) cases were complication-free, while there was acceptable residual deformity in 4(17.4%), pin lessening in 2(8.7%), pin tract infection in 3(13.0%), and restricted knee movement in 4(17.4%).
CONCLUSION: The Ilizarov External fixator is best for deformity correction in all dimensions and directions if the patient and attendant complain otherwise.

KEY WORD: Deformity, Knee, Ilizarov, Tibia, Varus, Valgus.

INTRODUCTION

Deformities in the upper limbs are well tolerated, but in the lower limbs, they create many problems and cannot be tolerated. Deformities in children are primarily metabolic but may occur secondary to trauma, either to growth plate or mal-united fracture. In adults, deformities are mainly traumatic, resulting from mal-united fractures. Deformities can also occur secondary to arthritis, either Rheumatoid or osteoarthritis. Deformity in the lower limb changes the mechanical axis of the limb, leading to pain and restriction of movement, ultimately ending in early osteoarthritis of the affected limb. Therefore, correcting deformity in the lower limb needs urgent attention to avoid complications. There are a lot of ways to correct it. In children with a juxta-articular area, either temporary or permanent epiphysiodesis of the affected bone can be done in a single stage by stapling or plating. However, the original challenges come when the deformity is found in adults. In adults, there are also many surgical procedures to correct the mechanical axis of the lower limb. In acute correction, the surgical procedure is opening or closing wedge osteotomy with plating/nailing, but this procedure is not free of complications. Opening the wedge requires a bone graft and causes lengthening while closing the wedge causes shortening. Still, one method that neither causes shortening nor lengthening or bone grafting with less complication is called close osteotomy and application of Ilizarov. With Ilizarov, deformity can be corrected gradually without affecting the soft tissues. If there is a shortening, it can elongate the bone post-operatively with gradual distraction. A particular type of frame called Taylor Spatial Frame is computer operated; all the deformity is entered into the software and calculates how much struts must be rotated for how many days to correct the deformity, but it is high cost. The one and single most important benefit of Ilizarov is that one can correct the deformity post-operatively to his satisfaction, which cannot be done with acute correction with osteotomy and plating/nailing.

METHODOLOGY

This case series study on twenty-three patients of either sex was conducted in Akbar Medical Center Peshawar from November 2016 to April 2021. The ages of the patients were ten and above. To reduce the bias, we have excluded patients with diabetes mellitus, patients on oral anticoagulants, tobacco addicts and those on steroid or immunocompromised patients.

Patients were admitted from the outpatient

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department. All the patients who fulfilled the inclusion criteria were counselled for the procedure, and written informed consent was obtained. All patients have done a scanogram of both lower limbs beforehand, and the site and magnitude of deformity have been calculated. The same consultant did all the surgeries. Paper tracing was done, and the angle of deformity was calculated. Patients were either anaesthetized by spinal or general anaesthesia. At the time of induction, two grams of cefoperazone + sulbactum were given intravenously after the test dose. A pre-fabricated Ilizarov frame that contains hinges is fixed to the bone with wires and shanz pins. Then, a 1-2 centimetre incision was given over the deformity, and a closed corticotomy was done with the help of an osteotome. The rings were loosened to check that the corticotomy was complete or vice versa. After full recovery, the wound is closed, the antiseptic dressing is done, and the patient is shifted to the orthopaedic unit. On the day of discharge from the unit, the patient was instructed for follow-up, daily dressing, and distraction. After two weeks of operation, the patient and attendant were asked to rotate the nuts of two hinges on the concave side of the deformity, half turn in the morning and half turn in the evening. Patients were followed up at two weeks, six weeks, ten weeks, 14 weeks, six months and ninth months, while some needed a one-year follow-up. A scanogram or x-ray of the affected limb was done at the final follow-up to check the correction.

Preoperatively, the deformity was calculated to determine how long it would take to correct, so double the time was required to consolidate the callus at the corticotomy site when it was corrected. So, some frames were removed early while others were removed late. All the data were collected with the help of a proforma and then entered into SPSS version 20 for analysis.

RESULTS

There were 23 patients: nine males (39.1%) and fourteen females (60.9%). **Table I.**

The mean age was 19.39, the minimum was 10, and the maximum was 40 years. **Table II**

Both sides were involved 6(26.1%) in while right 9 (39.1%) was involved in and left 8(34.8%) in cases. **Table III**

Site of deformity was ankle in 4(17.4%), femur in 4 (17.4%), knee in 8(34.8%) while tibia was involved in 7(30.4%) cases. **Table IV**

A single osteotomy was done in 16(69.6%) cases, while a double osteotomy was done in 7(30.4%) cases due to the CORA being calculated in two places. **Table V**

Ten (43.5%) cases were complicated-free, while there was acceptable residual deformity in 4(17.4%), pin lessening in 2(8.7%), pin tract infection 3(13.0%), and restricted knee movement in 4(17.4%). **Table VI**

Table I: Gender of Patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	14	60.9	60.9	60.9
	Male	9	39.1	39.1	100.0
	Total	23	100	100	

Table II: Statistics

	Age of the Patient
N Valid	23
Missing	0
Mean	19.39
Median	18.00
Mode	12
Std. Deviation	7.057
Range	30
Minimum	10
Maximum	40

Table III: Side involment

		Frequency	%	Valid %	Cumulative %
Valid	Both	6	26.1	26.1	26.1
	Left	8	34.8	34.8	60.9
	Right	9	39.1	39.1	100
	Total	23	100	100	

Table IV: Site of deformity

		Frequency	%	Valid %	Cumulative %
Valid	Ankle	4	17.4	17.4	17.4
	Femur	4	17.4	17.4	34.8
	Knee	8	34.8	34.8	69.6
	Tibia	7	30.4	30.4	100
	Total	23	100	100	

Table V: Type of Surgery

		Frequency	%	Valid %	Cumulative %
Valid	Double osteotomy	7	30.4	30.4	30.4
	Osteotomy	16	69.6	69.6	100
	Total	23	100	100	

Table VI: Complications

		Frequency	%	Valid %	Cumulative %
Valid	Correction of deformity is not perfect, but acceptable	4	17.4	17.4	17.4
	No Complications	10	43.5	43.5	60.9
	Pin Loosening	2	8.7	8.7	69.6
	Pin tract infection	3	13.0	13.0	82.6
	Restricted ROM	4	17.4	17.4	100
	Total	23	100	100	

DISCUSSION

In children under six, the valgus/varus malalignment of the extremities is normal; it is anticipated that the mechanical axis will undergo some correction beyond the age of eight, and treatment for severe valgus—whether pathological or physiological - may be required[16]. Multiple illness situations, including trauma, infections, metabolic abnormalities (rickets), and other kinds of dysplasias, as well as secondary diseases such as fibrous dysplasia and enchondromatosis[17], can cause pathological genu valgum. A scanogram should be used to assess children who have excessive genu-valgum. Valgus deformity can occasionally worsen and even become symptomatic. Patients in this category may experience their children walking with uncomfortable knee rubbing, which can result in a subluxation of the patella to the side [18,19].

Excessive genu valgum requires treatment at or after skeletal maturity. To support the bone, the surgeon often uses a compression plate that is shaped to address the deformity, but occasionally, a blade plate is preferred[20]. Various types of osteotomies have been widespread, although Ilizarov opening wedges are more prevalent than closing wedges for acute corrections[21]. A closing wedge osteotomy must be performed while applying a 90° blade plate by withdrawing a wedge from the medial supracondylar region and stabilizing it with blade plate[22]. An ordinary 90° plate with offset - typically utilized in intertrochanteric osteotomies - offers additional stability for early patient movement. If correction is needed, tibial medial closure wedge osteotomy could be an excellent surgical option[23]. In most cases, recovery takes four weeks, and no graft is needed[20]. According to several studies and our work, a 10° joint surface tilt in the coronal plane is well tolerated at or after skeletal maturity correction is needed for excessive genu valgum[23-25].

In the current study, a total of 23 patients with Ilizarov. All osteotomies were opening wedge followed by Ilizarov ring fixator. Hundred percent correction was achieved in 19 patients (82.6%) regarding deformity correction, knee range of motion, leg length discrepancy and union at the osteotomy site. Complications in our study were pin lessening in 2 (8.7%), pin tract infection 3(13.0%), and restricted knee movement in 4(17.4%).

CONCLUSION

Ilizarov External fixator is best for deformity correction in all dimensions and directions if the patient and attendant complain otherwise. Physiotherapy and exercise can prevent many complications and make it a success.

Ethical permission: Akbar Medical Center and Hospital, Peshawar IRB letter No. 8-18/MI/IRB.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Inam M: Topic selection for research, data collection and analysis
Saeed M: Worked as Ilizarov fellow and collected retrospective data
Akbar A: Patients follow-up, data compilation

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