

# Prospective Study to Assess the Osteogenic Potential of *Cissus Quadrangularis* in Tibia Fractures Treated with Intramedullary Interlocking Nailing

Dr. Vaibhav Chaurasia<sup>1</sup>, Dr. Karthik SR<sup>2</sup>, Dr. Sathik Babu M B<sup>3</sup>

<sup>1</sup>Postgraduate Resident, Department of Orthopaedics, Chettinad Hospital and Research Institute, India  
Mobile No– 9022466877

Email id: vaibhav.chaurasia4[at]gamil. com

<sup>2</sup>Senior Resident, Department of Orthopaedics, Chettinad Hospital and Research Institute, India  
Mobile No – 9710483738

Email id: karthiksr93[at]gmail.com

<sup>3</sup>Professor & HOD, Department of Orthopaedics, Chettinad Hospital and Research Institute, India  
Mobile No – 9790859196

Corresponding Author Email id: dr.batcha[at]gmail.com

**Abstract:** A routine fracture of tibia matures in about 16 to 20 weeks and hence hinders normal function significantly. To speed up the healing process and enable early function, alternatives are being investigated. The objective of this prospective study was to evaluate the osteogenic potential of the medication *Cissus quadrangularis* (CQ) on the healing of tibial fractures. Design Randomized prospective trial. **Results:** Alkaline phosphatase levels in the CQ group increased statistically significantly compared to the control group, according to the analysis between the groups. Clinical findings (reduction in pain and mobilisation) and other biochemical findings (serum calcium, serum phosphorous) did not statistically differ between the CQ and control groups. However, radiographic findings (callus formation) were found to be marginally better in the CQ group as compared to the control group. **Conclusion:** We concluded that a larger sample size is necessary to determine the absolute value of CQ before incorporating it into the fracture regimen because there was not a statistically significant improvement in practically all measures, with the exception of the alkaline phosphatase levels.

**Keywords:** Tibia fracture, IMIL nailing, Ciss quadrangularis.

## 1. Introduction

One of the most frequent orthopaedic injuries is a tibial fracture [1]. Even after the proper surgical procedures, these fractures are linked to post - operative discomfort, limited mobility, and drawn - out rehabilitation. Hence, unconventional herbal therapies have been applied in an effort to shorten the recovery time and speed up the healing [2–5].

Ayurveda regularly uses the succulent plant *Cissus quadrangularis* (CQ), a member of the Vitaceae family, to treat fractures [6]. To promote early fracture union, the processed stem is consumed [7]. According to reports, CQ's effectiveness in promoting early ossification and bone remodelling is a result of its capacity to boost metabolism and promote the uptake of minerals by osteoblasts [3]. The purpose of the current study was to determine if CQ offers a quantifiably early healing and to evaluate the benefits of including CQ in a routine fracture treatment plan. In this study, two groups of tibial fracture patients who received comparable care were compared: one group underwent surgery and oral CQ, and the other group underwent only surgery.

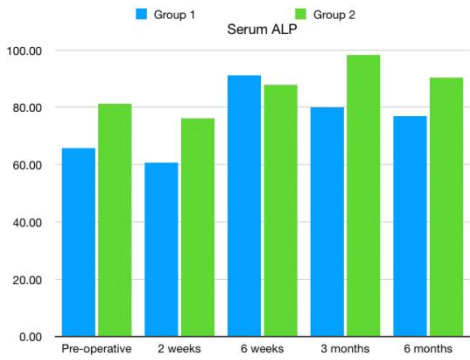
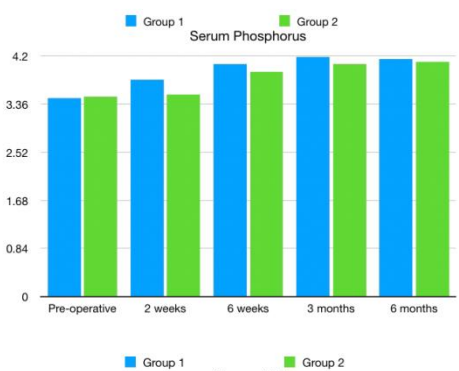
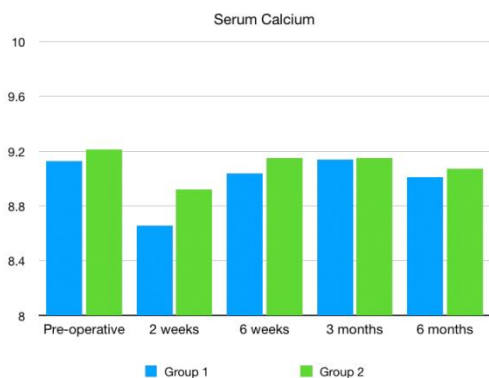
## 2. Methodology

The study had 30 willing participants who visited the Department of Orthopaedic Surgery in 2020–2022, each with a closed tibia fracture of an extremity. Transverse and oblique fractures of Gustilo - Anderson Grade I and II that manifested within 24 hours of the injury were included. Individuals of either sex between the ages of 20 and 60 were included. The study excluded patients who had open wounds, comminuted fractures, endocrine disorders, or metabolic disorders. The CQ group and control group were randomly assigned to the study's patients. 15 patients from the CQ group received two capsules of *C. quadrangularis* (250 mg each) B. D. for 42 days following trauma. The CQ medication was not administered to the control group. For this investigation, generic CQ pills were used (Tab. CissQ 250 mg). All patients received injectable antibiotics and analgesics for 5 days following surgery in addition to CQ. Under appropriate anaesthesia, the fracture was treated with closed reduction and internal fixation using an intra - medullary interlocking nail (IMIL). After a trauma, surgical therapy was started as soon as possible. Preoperatively, at 2 weeks, 6 weeks, 3 months, and 6 months after surgery, the following variables were noted: Clinical parameters—pain, mobilisation, and radiological parameters on X - ray: callus formation. Biochemical parameters—serum calcium, phosphorous, and alkaline phosphatase. A visual analogue

scale and mobilisation were used to measure pain.

**Statistical Analysis**

The Shapiro - Wilk test was used to determine if each quantitative variable approximated normality. A Greenhouse - Geisser analysis was used to compare each of the biochemical and pain measures numerous times across intergroups. The threshold for statistical significance was established at 0.05.



	Follow up	Sr. Ca	Std Deviation	p value
Group I	Pre - operative	9.13	0.34	0.86
	2 weeks	8.66	1.35	
	6 weeks	9.04	0.54	
	3 months	9.14	0.42	
	6 months	9.01	0.41	
Group II	Pre - operative	9.21	0.61	
	2 weeks	8.92	0.53	
	6 weeks	9.15	0.45	
	3 months	9.15	0.26	
	6 months	9.07	0.22	

	Follow up	Sr. Phosphorus	Std Deviation	p value
Group I	Pre - operative	3.47	0.79	0.8
	2 weeks	3.79	1.84	
	6 weeks	4.06	0.4	
	3 months	4.2	0.38	
	6 months	4.15		
Group II	Pre - operative	3.49	0.9	
	2 weeks	3.53	0.7	
	6 weeks	3.92	0.63	
	3 months	4.06	0.55	
	6 months	4.1	0.57	

	Follow up	Sr. ALP	Std Deviation	p value
Group I	Pre - operative	65.8	15.58	0.01
	2 weeks	60.61	20.3	
	6 weeks	91.13	19.49	
	3 months	80.06	18.88	
	6 months	76.8		
Group II	Pre - operative	81.33	25.71	
	2 weeks	76.08	23.51	
	6 weeks	87.83	19.86	
	3 months	98.25	21.14	
	6 months	90.5	20.02	

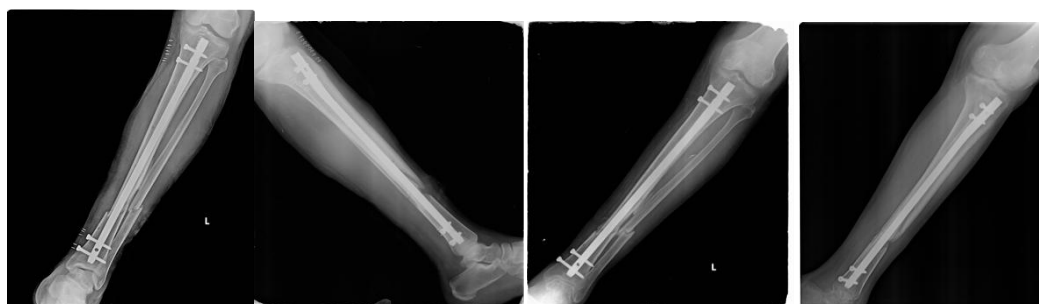


Figure 1: Showing immediate post op X - ray and 6 month follow up X - ray of patient in group 1



Figure 2: Showing immediate post op X - ray and 6 month follow up X - ray of patient in group 2

### 3. Result

Two groups of fracture patients were examined in this prospective, randomised experiment. Each group had fifteen patients. With the exception of the CQ group's consumption of CQ capsules, the treatment of fracture fixation for both the CQ group and the control group was similar. About 13 tibia fractures in group I received closed reduction and intramedullary interlocking nails, while two patients had open reduction and internal fixation with the same device. Of 15 tibia fractures in group II, 14 patients received internal fixation with an intramedullary interlocking nail and closed reduction, whereas one patient received internal fixation with an open reduction and an intramedullary interlocking nail. Following are the headings for the results: radiological, clinical, and biochemical parameters. The serum calcium and phosphorous levels during the follow - up period did not differ statistically between the CQ and control groups. At each of the follow - up intervals, the alkaline phosphatase levels in the CQ group were statistically higher than those in the control group. By day 5, all patients in group 1 had begun fully weight - bearing walking. One patient in group 2 began full weight bearing walking on day 7, compared to 14 patients in group 2 who began on day 5. Patients in group I who had serial follow - up X - rays demonstrated that all patients developed bicortical calluses at the conclusion of three months. In control group 12 patient had achieved bicortical bridging callus formation while 3 patient had unicortical callus formation at the end of 3 months.

### 4. Discussion

Young individuals, in whom this fracture is frequently observed, experience lost productivity due to the delayed healing process associated with tibia fractures. The fracture matures at 20 weeks after stabilising in 4 - 6 weeks [1]. The purpose of this study was to assess CQ's effectiveness in accelerating tibial fracture healing and determine whether the drug may be used as an adjunct to standard tibial fracture treatment. Several publications have documented the benefits of *C. quadrangularis* on early ossification and bone remodelling in both animal models [7, 8 - 12] and human patients [2, 3, 11]. Pharmacologically, the *C. quadrangularis* plant is rich in calcium, anabolic steroids, and carotene A. Moreover, it contains two asymmetric tetracyclic triterpenoids, onocer - 7 - ene - 3a, 21b - diol (C<sub>30</sub>H<sub>52</sub>O<sub>2</sub>, m. p.200 - 202°C) and onocer - 7 - ene - 3b, 21a - diol (C<sub>30</sub>H<sub>52</sub>O<sub>2</sub>, m. p.233 - 234 °C), along with ascorbic acid and calcium oxalate. It has also been noted that b - sitosterol, d - amyirin, and d - amyron are present. A novel asymmetric

tetracyclic triterpenoid, 7 - oxo - onocer - 8 - ene - 3b - 21a - diol (C<sub>30</sub>H<sub>50</sub> O<sub>3</sub>, m. p.235 - 237 °C), as well as the following compounds have been identified in the aerial parts of *C. quadrangularis*: 4 - hydroxy - 2 - methyl - tricos - 2 - ene - 22 - one, 9 - methyl octadec - 9 - ene, hept Morever, it contains trace amounts of isopentacosanoic acid, friedelan - 3 - one, taraxerol, and taraxeryl acetate [12]. A phytogetic steroid extracted from CQ has been shown to stimulate osteoblasts and promote early fracture healing in other investigations as well [4, 6]. The second suggested cause is that *C. quadrangularis* improves both the functional efficiency and chemical makeup of the fractured bone, including its mucopolysaccharides, collagen, calcium, and phosphorus [4]. Alkaline phosphatase, an enzyme released by the osteoblast, rises during fracture healing, signalling the development of calluses [6]. Alkaline phosphatase levels rise in direct proportion to the callus's volume and mineralization [13]. Alkaline phosphatase levels in the CQ group were significantly higher than those in the control group at all time points in the current trial, but there was no statistically significant difference between the two groups' radiographic, clinical, or other biochemical data. These results contrasted with those of Deka et al. [7], who found that the CQ - treated sample had a quicker rate of callus formation due to an early decrease in serum calcium and an increase in alkaline phosphatase. On the other hand, Singh et al. [2, 3] found that the CQ - treated group had higher levels of calcium, phosphorus, and alkaline phosphatase as well as a quicker rate of pain reduction and early weight - bearing mobilisation. Despite efforts to assess CQ's effectiveness, no conclusive results have been reached because there are not enough human studies, systematic reviews, or meta - analyses of this plant's medical applications [14]. The potential for toxicity, which has been linked to the consumption of several Ayurvedic medicines [15], is the other inhibitor. According to the results of all the research described before, the study's participants experienced no negative side effects from the medication.

### 5. Conclusion

The use of herbal treatments like *C. quadrangularis* has been promoted to speed the healing of fractures. We concluded that the healing must be clinically significant and radiographically quantifiable in order to be employed as an adjuvant. Biochemical data from this trial suggested that patients who were administered CQ formed calluses more quickly, but there was no discernible radiological or clinical improvement when compared to the control group. Based on the results of this trial, we believe that adding CQ as an adjunct to the standard course of therapy for tibial fractures

may not be very beneficial and advise that a broader population be evaluated to determine its benefit generally.

org/10.1177/0009922814553397

## References

- [1] Burgess AR, Poka A, Brumback RJ, et al. Pedestrian tibial injuries. *J Trauma*.1987; 27 (6): 596–601.
- [2] Singh V, Singh N, Pal US, Dhasmana S, Mohammad S, Singh N (2011) Clinical evaluation of *Cissus quadrangularis* and *Moringa oleifera* and osteoseal as osteogenic agents 2 (2): 132–136. <https://doi.org/10.4103/0975-5950.94466>
- [3] Singh N, Singh V, Singh RK et al (2013) Osteogenic potential of *Cissus quadrangularis* assessed with osteopontin expression. *Natl*
- [4] Mohammad S, Pal US, Pradhan R, Singh N (2014) Herbal remedies for orthopaedic fracture.5 (1): 35–38. <https://doi.org/10.4103/0975-5950.140167>
- [5] Brahmkshatriya HR, Shah KA, Ananthkumar GB, Brahmksha - triya MH (2015) Clinical evaluation of *Cissus quadrangularis* as osteogenic agent. <https://doi.org/10.4103/0974-8520.175542>
- [6] Udupa KN, Prasad G, Sen SP (1965) The effect of phytogetic steroid in the acceleration of fracture repair. *Life Sci* 4: 317–327
- [7] Deka DK, Lohan LC, Saikia J, Mukti A (1994) Effect of *Cissus quadrangularis* in accelerating healing process of experimentally fractured radius ulna of dog: a preliminary study. *Indian J Pharmacol* 26: 44–45
- [8] Shirwaikar A, Khan S, Malini S (2003) Antiosteoporotic effect of ethanol extract of *Cissus quadrangularis* Linn. on ovariectomized rat. *J Ethnopharmacol* 89 (2–3): 245–250
- [9] Sanyal A, Ahmad A, Sastry M (2005) Calcite growth in *Cissus quadrangularis* plant extract, a traditional Indian bone - healing aid. *Curr Sci* 89 (10): 1742–1745
- [10] Maiti SK, Saravanan B, Singh GR, Kumar N, Hoque M, Lal J et al (2007) Evaluation of the Herb, *Cissus quadrangularis* in accelerating the healing process of femur osteotomies in dogs. *J Appl Anim Res* 31 (1): 47–52
- [11] Sharma N, Nathawat RS, Gour R, Patni V (2011) Establishment of callus tissue and effect of growth regulators on enhanced sterol production in *Cissus quadrangularis* L. *Int J Pharmacol* 7 (5): 653–658
- [12] Mishra G, Srivastava S, Nagori BP (2010) Pharmacological and therapeutic activity of *Cissus quadrangularis*: an overview. *Int J PharmTech Res* 2 (2): 1298–1310
- [13] Muljac'ic A, Poljak - Guberina R, Turc'ic J, Z'ivkovic O, Guberina M et al (2010) The changes of bone - specific alkaline phosphatase (BsALP) associated with callus formation and rate of bone healing. *Croat Chem Acta* 83 (3): 315–321
- [14] Sawangjit R, Puttarak P, Saokaew S, Chaiyakunapruk N (2017) Efficacy and safety of *Cissus quadrangularis* L. in clinical use: a systematic review and meta - analysis of randomized controlled trials. *Phytother Res*. <https://doi.org/10.1002/ptr.5783>
- [15] Datta - Mitra A, Ahmed O Jr (2015) Ayurvedic medicine use and lead poisoning in a child: a continued concern in the United States. *Clin Pediatr (Phila)* 54 (7): 690–692. <https://doi.org/10.1177/0009922814553397>