

Is tibial nerve injury an indication for amputation?

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Section 1: Background

Posterior tibial nerve injury had traditionally been regarded as a major adverse factor in severe lower-extremity trauma because of absent plantar sensation and intrinsic foot function. In older limb assessment frameworks, loss of plantar sensation or tibial nerve injury was often considered a factor favoring amputation, especially when combined with severe soft-tissue injury, ischemia, contamination, and vascular compromise. However, the current literature does not support tibial nerve injury as an absolute indication for amputation.

The available evidence is limited, but it is directly relevant to the clinical question. The most directly relevant studies include a retrospective analysis of severe open tibial fractures that incorporated nerve injury into scoring systems, a case series of severe lower-extremity trauma with documented posterior tibial nerve transection, a cohort study of combat-related tibial fractures with peripheral nerve injury, a case report of tibial nerve repair using a vascularized nerve graft, and a case report of complete tibial nerve transection treated with allograft reconstruction. These studies suggest that useful limb function can return after tibial nerve repair or reconstruction in selected patients.(1–5)

Section 2: Data extraction table

S.no	Author, year of publication, Country	Study Design	Sample Size	Study population (Inclusion and exclusion criteria)	Groups compared	Results
1	McNamara et al., 1994, USA(1)	Retrospective observational study	24 type IIIB/IIIC tibial fractures	Patients with Gustilo IIIB and IIIC open tibial fractures assessed using MESS and NISSA; not a dedicated posterior tibial nerve cohort.	Salvaged limbs vs amputated limbs; MESS vs NISSA.	Among limbs with clinically absent tibial nerve function and complete segmental disruption, most were amputated (5 out of 7), but two were salvaged; one recovered protective plantar sensation and one had poor functional outcome. Combined soft-tissue and skeletal injury was the only significant predictor in regression analysis.
2	Halim and Yusof, 2004, Malaysia(2)	Case report	1	Open tibia-fibula fracture with posterior tibial nerve and artery injury, segmental bone loss, soft-tissue loss, and chronic osteomyelitis after earlier treatment.	No formal comparator; salvage with composite vascularised osteocutaneous fibula and vascularised sural nerve graft.	A 10-cm posterior tibial nerve defect was reconstructed. At 1 year, the patient had skeletal union, full weight bearing, and recovery of crude touch, pain, proprioception, and temperature at the plantar foot, with no pressure sore or ulceration.

3	Beltran et al., 2012, USA(3)	Retrospective cohort	32 patients, 43 peripheral nerve injuries	Combat-related type III open tibia fractures with peripheral nerve injury distal to the popliteal fossa; included tibial and peroneal nerve injuries.	Motor vs sensory nerve recovery; analyses by mechanism, fracture severity, soft-tissue injury, nerve injured, and fracture location.	At average 20- month follow-up, 89% of injured motor nerves and 93% of injured sensory nerves were functional. The authors concluded that discussions about limb salvage and amputation should not be overly influenced by peripheral nerve status.
4	Momoh et al., 2015, USA/India(4)	Retrospective Case series	8	Severe lower- extremity trauma with documented posterior tibial nerve laceration managed at Ganga Hospital; all underwent limb salvage and posterior tibial nerve repair.	Case series compared narratively with systematic review literature on lower- extremity salvage.	Median pain score was 20/100; median plantar light-touch score was 2/5; median ankle plantar flexion was 27.5 degrees and extension 10 degrees; median heel flexor strength was 3/5; all patients ambulated independently; all returned to work at mean follow-up of 56 months. Authors concluded salvage had value even in patients with posterior tibial nerve injury.

5	Mercer et al, 2023, USA(5)	Case report	1	Gustilo IIIA distal tibia/fibula fracture with calcaneal fracture, posterior tibial artery injury, and complete tibial nerve transection.	No formal comparator; staged salvage with fixation and tibial nerve allograft reconstruction.	Protective plantar sensation returned by 22 months. At 29 months the patient remained ambulatory with a salvaged limb, had fracture healing, no clinical infection, and return to limited work duties.
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Section 3: Results

The evidence does not support tibial nerve injury as an absolute indication for amputation. The older scoring literature shows why tibial nerve injury became associated with amputation: in severe open tibial fractures, nerve injury was included in the NISSA score, and patients with high-energy limb-threatening injuries often had multiple coexisting predictors of amputation. Even so, McNamara et al. documented salvage in two limbs with absent tibial nerve function, including one that recovered protective plantar sensation.(1)

Beltran et al. found that in combat-related type III open tibial fractures, most peripheral nerve injuries were functional at follow-up and nerve status should not overly influence salvage versus amputation decisions.(3) The Ganga Hospital series by Momoh et al., specifically examined severe lower-extremity trauma with posterior tibial nerve transection and found that salvage with nerve repair produced acceptable function. All patients ambulated independently, pain was generally mild, plantar sensation partially returned in most patients, and all returned to work.(4)

The case reports are consistent with that message. Halim and Yusof reported a 10-cm posterior tibial nerve reconstruction with vascularized sural nerve graft and full weight

bearing at 1 year, with recovery of crude plantar sensation and no ulceration.(2) Another case report similarly showed that complete tibial nerve transection could be reconstructed with allograft, with return of protective plantar sensation and functional ambulation.(5) Tibial nerve injury is a major negative prognostic factor, but not a stand-alone indication for primary amputation.

Section 4: Discussion

The central clinical question is whether tibial nerve injury predicts a nonfunctional limb so reliably that amputation should be preferred. Tibial nerve injury matters because it threatens plantar sensation, intrinsic foot function, and protective loading, but the nerve can recover, be repaired, or be reconstructed, and meaningful function may still be achieved.

McNamara et al. reflects the origin of nerve-weighted salvage thinking. Their study of severe open tibial fractures showed that nerve injury was one component of the NISSA score, but the only statistically significant predictor in regression was the combination of soft-tissue and skeletal injury. That finding supports a broader orthoplastic approach that tibial nerve injury should be interpreted in the context of the entire limb and not in isolation.(1)

Beltran et al. show in combat-related type III open tibia fractures, most injured motor and sensory nerves were functional at follow-up, and the authors explicitly concluded that limb-salvage and amputation discussions should not be overly influenced by peripheral nerve status. However, this study was not limited to isolated tibial nerve transection and should therefore be interpreted as contextual rather than definitive evidence.(3)

The strongest directly relevant evidence comes from the Ganga Hospital case series. In that series, all eight patients had tibial nerve disruption and underwent repair. All patients were ambulatory and returned to work. Residual deficits remained, including reduced ankle motion and incomplete sensory recovery, but the limbs were functional and the patients reported limited disability. This is clinically important because it showed that a repaired tibial nerve can contribute to a functional salvaged limb.(4)

The 2004 case report shows nerve reconstruction across a long gap. After vascularized sural nerve grafting, the patient regained crude touch, pain, proprioception, and temperature, and he achieved full weight bearing without ulceration.(2) The 2023 case report adds modern evidence that tibial nerve allograft can restore protective plantar sensation after complete transection, even in the setting of a severe open fracture with major associated injuries.(5) These reports are limited by their case-report design, but they directly contradict the notion that tibial nerve transection makes salvage useless.

For present-day orthoplastic decision-making, tibial nerve injury should be treated as a major adverse factor, and not as an automatic indication for amputation. The decision should also consider vascular status, contamination, soft-tissue coverage, skeletal reconstruction gap length, rehabilitation burden, patient goals, and available microsurgical expertise. Literature supports salvage rather than automatic amputation.

Section 5: Risk of bias - HIGH overall risk of bias.

The directly relevant evidence includes one retrospective observational study, one retrospective cohort, one small case series, and two case reports. These designs are vulnerable to selection bias, publication bias, confounding, and incomplete outcome standardization. The evidence is consistent but is limited because there are no

randomized or high-quality comparative studies focused specifically on tibial nerve transection as an isolated decision variable.

Section 5: Response/Recommendation

*Tibial nerve injury should **not** be considered an absolute indication for amputation.* However, it remains a major adverse prognostic factor influencing functional outcomes after limb reconstruction. Limb salvage may be justified in selected patients when adequate vascularity, durable soft-tissue coverage, skeletal reconstruction, and tibial nerve repair offer the potential for meaningful sensory recovery. Therefore, the decision should be individualized and based on the overall reconstructive potential of the limb and anticipated functional outcome rather than the presence of tibial nerve injury alone.

Section 6: Level/ strength of Evidence: LOW strength of evidence.

The conclusion is based on a small number of directly relevant studies and remains limited by heterogeneity and high risk of bias. The findings are broadly consistent across the literature, but the evidence is insufficient to make tibial nerve injury an indication for amputation.

References

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