

Immediate Limb Lengthening Following Vascular Repair of Iatrogenic Arterial Lesions – A Report of Two Cases

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Learning Point of the Article:

Early initiation of distraction osteogenesis after arterial repair with autologous vein graft may be feasible and safe in selected patients when managed with meticulous multidisciplinary surveillance, challenging the assumption that prolonged delay is always necessary.

Abstract

Introduction: Vascular injury during distraction osteogenesis is rare but potentially limb-threatening, most often involving the popliteal artery during femoral or tibial osteotomies. Conventional opinion advises delaying distraction post-repair to protect grafts, though evidence is limited. This report presents two such cases, their surgical repair, early distraction initiation, and outcomes, challenging the assumption that prolonged delay is always required.

Case Report: A 16-year-old girl with hypochondroplasia and a 13-year-old boy with post-traumatic limb length discrepancy sustained intraoperative popliteal artery injuries during femoral lengthening. Both underwent urgent autologous great saphenous vein graft repair. Distraction timing was based on graft stability, with close post-operative vascular and radiographic monitoring. Distraction began 9 days post-repair in Case 1 and 14 days post-repair in Case 2, starting at 0.5 mm/day with adjustments for regenerate quality and vascular status. Lengthening goals (6.0 cm and 5.7 cm) were achieved without further vascular compromise. At long-term follow-up (12 years for case 1 and 9.5 years for case 2), no long-term vascular sequelae were reported.

Conclusion: Under careful multidisciplinary supervision and vigilant follow-up, distraction osteogenesis can be safely initiated shortly after arterial repair. This individualized approach allows for distraction without needing secondary surgery for re-osteotomy.

Keywords: Distraction osteogenesis, vascular injury, femoral lengthening, arterial repair, limb salvage.

Introduction

Bone lengthening, or distraction osteogenesis, is a surgical technique used to induce new bone formation between gradually separated bone segments. Originally pioneered by Ilizarov in the mid-20th century, the procedure has become a cornerstone in the treatment of limb length discrepancies, congenital skeletal deformities, and post-traumatic bone loss [1]. With the development of fully implantable intramedullary lengthening nails, outcomes and patient comfort have significantly improved

[2]. However, the procedure still carries inherent risks, including neurovascular complications, which, though rare, can have serious consequences [3].

Intraoperative arterial injury during limb lengthening surgery is an uncommon but potentially limb-threatening complication. Standard vascular surgery practice emphasizes prompt repair followed by delayed initiation of distraction, typically to avoid stress on the repaired vessel and to minimize the risk of thrombosis, graft failure, or ischemic complications. However,

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there is a lack of robust clinical evidence supporting the optimal timing of distraction in these scenarios.

This report presents two cases of intraoperative arterial injury during femoral lengthening procedure. One patient underwent lengthening due to hypochondroplasia and another undergoing complex reconstructive treatment following severe limb trauma. In both cases, iatrogenic and intraoperative arterial lesions were surgically repaired using autologous venous grafts. Notably, distraction was initiated after only minimally prolonging the latency phase without need for additional osteotomy. Both patients achieved successful bone lengthening without vascular compromise and maintained long-term limb function.

This report contributes to the limited literature on vascular complications during limb lengthening. The cases challenge the assumption that distraction must be significantly delayed following arterial repair and suggest that, under carefully monitored conditions, earlier initiation may be safe and effective.

Case Report

Case 1

A 16-year-old and skeletally mature girl with hypochondroplasia and a height of 141.5 cm was offered bilateral femoral lengthening to increase height. Initial, the left femur was lengthened 6 cm without any complications.

During the subsequent right femoral lengthening surgery, a distal percutaneous osteotomy was performed 7 cm proximal to the knee using a combination of pre-drilling and chisel techniques. During drilling, sudden profuse bleeding of bright red blood was observed, raising suspicion of arterial injury. The bleeding stopped spontaneously, and the patient remained hemodynamically stable. The procedure proceeded with insertion of a retrograde Fitbone intramedullary lengthening nail.

At surgery completion, pulses in the popliteal, posterior tibial, and dorsalis pedis arteries were absent, accompanied by clinical signs of distal ischemia including delayed capillary refill and decreased distal temperature. Doppler ultrasound confirmed vascular compromise. A vascular surgeon assessed the limb, which remained sufficiently perfused distally, allowing delay of urgent intervention.

Computed tomography (CT) angiography of the right lower limb, performed the following morning, revealed a 4 cm thrombosis of the popliteal artery just distal to the adductor canal, corresponding to the level of the osteotomy. The findings were consistent with an iatrogenic intraoperative arterial injury. Vascular repair was performed 26 h after injury using an end-to-

end bypass graft with autologous great saphenous vein harvested from the ipsilateral ankle. Postoperatively, the graft was deemed stable enough to allow distraction to commence 9 days after surgery, 3 days later than originally planned.

Lengthening was initiated at 0.5 mm/day with weekly clinical and radiographic monitoring. Pulses remained palpable throughout, with no signs of ischemia or neurological deficits. A total of 60 mm elongation was achieved over 86 days, corresponding to a lengthening index of 0.47 mm/day.

The patient was maintained on 75 mg daily acetylsalicylic acid for 12 months and followed regularly by vascular surgeons. At 3 months post-vascular repair, no signs of vascular compromise were noted. The intramedullary nail was removed 9 months after the initial surgery without complications. At nearly 12 years follow-up, the patient reported normal leg function without sequelae from the vascular injury. On clinical examination, peripheral circulation remained intact, with adequate palpable pulses in both the posterior tibial and dorsalis pedis arteries.

Case 2

A 9-year-old boy was referred for treatment of a 9 cm leg length discrepancy (LLD) following severe traumatic injury to his left knee at age 3 caused by a lawnmower accident. At age 9, a distal femur epiphysiodesis was performed to prevent further deformity.

The treatment plan included staged lengthening: initial tibial lengthening using a Taylor Spatial Frame, followed by two femoral lengthenings with intramedullary nails. At age 10, tibial lengthening achieved 5 cm over 59 days, resulting in a lengthening index of 0.39 mm/day. One year later, a retrograde Precice lengthening nail allowed 5 cm femoral lengthening over 59 days, with a lengthening index of 0.38 mm/day.

At age 13, during the second femoral lengthening procedure, the existing nail was exchanged for a longer one to permit 8 cm of lengthening. A new osteotomy was performed just distal to the prior site, which was 8 cm proximal of the knee. While drilling ventilation holes, poor bone quality impaired cortical feedback, and sudden profuse bleeding of bright red blood was noted, raising suspicion of arterial injury. Compression controlled bleeding after 2 min.

Intraoperative Doppler ultrasound by a vascular surgeon confirmed adequate distal flow, allowing completion of the procedure without immediate vascular repair. Post-operative CT angiography revealed a 12 mm pseudoaneurysm of the popliteal artery distal to the adductor canal.

Subacute vascular repair was performed 29 h after injury, utilizing an autologous reversed great saphenous vein graft.

Distal pulses were restored with flow of 150 mL/min. The patient received acetylsalicylic acid (75 mg daily for 3 months) and subcutaneous dalteparin (2,500 IU daily) during admission.

Following multidisciplinary agreement, distraction was initiated 14 days post-operative to allow for vascular graft healing. Lengthening commenced at 0.5 mm/day, maintained for 4 weeks, then increased to 0.75 mm/day. Clinical and radiographic monitoring every 2 weeks showed no signs of vascular compromise. Over 93 days, a total elongation of 5.7 cm was achieved, corresponding to a lengthening index of 0.54 mm/day.

The final lengthening stage occurred 25 months later using a Fitbone lengthening nail, achieving 8 cm elongation over 97 days and a lengthening index of 0.39 mm/day. Nail removal at age 18 was uneventful.

After nail removal, the patient exhibited a residual 2 cm LLD and was pain-free. Nine and a half years post-vascular repair, the patient retained the ability to run and bear full weight on the affected limb.

Discussion

Vascular complications during limb lengthening procedures remain rare but potentially serious. The two cases presented illustrate different clinical scenarios of arterial injury related to distraction osteogenesis: An acute intraoperative arterial transection and a subacute pseudoaneurysm formation, both managed successfully with vascular reconstruction using autologous vein grafts. Distraction was initiated at or near conventional post-operative intervals, under close multidisciplinary monitoring, allowing successful bone lengthening without need for additional osteotomy and without vascular or neurological sequelae.

Pseudoaneurysm formation is an uncommon yet recognized complication in the context of limb lengthening, particularly involving vessels adjacent to osteotomy sites. These injuries may result from direct trauma during osteotomy or pin placement or from mechanical stress on the arterial wall during distraction. Martínez Ros et al. described pseudoaneurysm formation complicating bone lengthening, underscoring the need for vigilance during the distraction phase [4]. Other reports have documented false popliteal aneurysms after tibial osteotomy, often linked to direct arterial injury or secondary to pin migration [5,6].

Management of vascular injuries in limb lengthening requires prompt surgical or endovascular intervention to restore distal perfusion and prevent ischemic complications. In both our cases, urgent repair using autologous saphenous vein grafts

successfully restored arterial flow, permitting distraction initiation within standard timeframes. This aligns with findings by Bowman et al., who reported successful popliteal artery pseudoaneurysm repair after tibial lengthening osteotomy in a pediatric patient, allowing continuation of the lengthening process [7]. In an experimental animal study, Kim et al. demonstrated safe femoral lengthening after stent-graft repair of a superficial femoral artery injury, supporting early distraction initiation under careful surveillance [8].

Understanding the regional vascular anatomy and maintaining surgical vigilance are crucial to minimize iatrogenic arterial injury. Minor deviations in pin trajectory or drill depth can cause significant vessel damage, especially in patients with altered anatomy from previous trauma, congenital abnormalities, or scarring. This is reflected in literature describing vascular lesions secondary to corticotomy and osteotomy procedures [9]. Intraoperative assessment with Doppler ultrasound and post-operative imaging such as CT angiography play vital roles in timely diagnosis, as subtle clinical signs may delay recognition of pseudoaneurysms or thrombosis [10,11].

The literature also highlights that early vascular involvement and multidisciplinary management significantly improve limb salvage and functional outcomes. Robinson and Belkin emphasize the ongoing surgical challenges posed by acute limb ischemia from popliteal artery aneurysms, highlighting the importance of rapid diagnosis and repair [11]. Although vascular injuries during limb lengthening are rare, they require prompt recognition and coordinated care to ensure both vascular and orthopedic success.

Our cases reinforce the potential for safe and effective distraction osteogenesis following arterial repair when combined with careful clinical and imaging surveillance and individualized antithrombotic therapy. With little literature to guide timing, our experience shows that early initiation of distraction at 9 and 14 days can be feasible when individualized monitoring is applied. Hereby, distraction can be initiated without the need for later re-osteotomy.

In conclusion, arterial injuries during limb lengthening, though uncommon, demand early recognition, immediate repair, and interdisciplinary collaboration. With vigilant post-operative monitoring and tailored treatment plans, distraction osteogenesis can proceed safely without compromising vascular integrity or limb function.

Limitations

Include the small sample size, variability in graft technique, and lack of post-operative imaging (e.g., duplex or magnetic

resonance angiography) to objectively confirm long-term graft patency. Despite these limits, our experiences suggest that earlier-than-expected distraction after arterial repair may be feasible and safe in select patients.

Conclusion

Vascular injuries during limb lengthening procedures, while rare, represent serious complications that require timely recognition and multidisciplinary management. The two cases presented demonstrate that early arterial repair using autologous vein grafts followed by initiation of distraction osteogenesis within a standard post-operative window can be

safe and effective. However, close clinical and radiographic monitoring is recommended to detect and prevent vascular compromise during the lengthening process.

Clinical Message

Arterial injury during distraction osteogenesis is an uncommon but serious complication that demands rapid recognition, prompt repair, and close interdisciplinary management. These two cases demonstrate that, with vigilant vascular monitoring and careful patient selection, distraction can be safely initiated within the standard post-operative timeframe following autologous vein graft repair. This approach avoids the need for additional re-osteotomy.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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References

1. Ilizarov GA. The tension-stress effect on the genesis and growth of tissues. Part I. The influence of stability of fixation and soft-tissue preservation. *Clin Orthop Relat Res* 1989;238:249-81.
2. Horn J, Grimsrud Ø, Dagsgard AH, Huhnstock S, Steen H. Femoral lengthening with a motorized intramedullary nail. *Acta Orthop* 2015;86:248-56.
3. Frost MW, Rahbek O, Traerup J, Ceccotti AA, Kold S. Systematic review of complications with externally controlled motorized intramedullary bone lengthening nails (FITBONE and PRECICE) in 983 segments. *Acta Orthop* 2021;92:120-7.
4. Martínez Ros J, Molina González J, Salcedo Cánovas C, Abellán Rivero D, Hernández Torres A, Taboada Martín R, et al. Pseudoaneurysm as an unusual complication in bone lengthening. *JPRAS Open* 2024;41:98-103.
5. Goubier JN, Laporte C, Saillant G. False popliteal aneurysm after tibial osteotomy: A case report. *Rev Chir Orthop Reparatrice Appar Mot* 2000;86:621-4.
6. Shenoy PM, Oh HK, Choi JY, Yoo SH, Han SB, Yoon JR, et al. Pseudoaneurysm of the popliteal artery complicating medial opening wedge high tibial osteotomy. *Orthopedics* 2009;32:442.
7. Bowman JN, Ellozy SH, Ting J, Ghiassi S. Successful repair of popliteal artery pseudoaneurysm after tibial lengthening osteotomy in a 7-year-old boy. *Vasc Endovasc Surg* 2009;42:610-4.
8. Kim MK, Kwon ST, Chang H, Minn KW, Cho TJ, Choi IH. Distraction histogenesis of an anastomosed artery. *Injury* 2008;39:719-24.
9. Spinelli F, Spinelli R, Stilo F, De Caridi G, Mirenda F. Vascular lesions secondary to osteotomy by corticotomy. *Chir Ital* 2007;59:575-9.
10. Szyber J, Skóra J, Rybak W, Pupka A. Iatrogenic pseudoaneurysm of the popliteal artery following corrective tibial osteotomy. *Vasa* 2011;40:414-7.
11. Robinson WP 3rd, Belkin M. Acute limb ischemia due to popliteal artery aneurysm: A continuing surgical challenge. *Semin Vasc Surg* 2009;22:17-24.

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