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# Diagnostic and Management Ruptur Artery Radialis and Ulnaris Sinistra et causa Vascular Trauma : A Case Report



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## ABSTRACT

**Background:** Vascular trauma is a life-threatening injury caused by a stab wound, blunt, or iatrogenic wound that damages a blood vessel. Vascular trauma can involve arteries and veins. Vascular trauma requires diagnosis and action fast handling to avoid fatal consequences in the form of amputation. This case report will discuss vascular trauma to the radial and ulnar arteries due to work accidents.

**Case Description:** A 19-year-old patient came with his colleague from the Emergency Department with the chief complaint of bleeding in his left hand. The patient experienced this while working on repairing electrical pipes an hour ago. The incident began when the electric cable fell from the power pole, and then the car grabbed the power cable so that it wrapped around the patient's left hand, injuring the patient's hand and bleeding. The supporting examination was an X-ray of the upper extremity. Although the impression on the radiological examination was that the radial and ulnar bones looked good, there were soft tissue defects in the dorsal-lateral of the distal antebrachial. However, on laboratory examination, blood was within normal limits. The treatment included vascular exploration surgery, vein autograft, harvesting of vena saphena Magna for vascular reconstruction, skin graft, and debridement. During treatment, the cruris Sinistra is given light therapy to repair damaged vascularisation.

**Conclusion:** Vascular trauma is an injury caused by a stab wound, blunt object, or iatrogenic wound that damages a blood vessel. In this case, ruptured artery radialis and ulnar sinistra et cause trauma was found. Therefore, the treatment was to do vascular exploration surgery, vein autograft, harvesting of vena saphena magna for vascular reconstruction, and debridement.

**Keywords:** Vascular trauma, vascular exploration surgery, vein autograft, skin graft.

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## BACKGROUND

Vascular trauma is a life-threatening injury caused by a stab wound, blunt, or iatrogenic wound that damages a blood vessel. Trauma to blood vessels threatens the survival of the bleeding part of the body. Therefore, vascular trauma requires diagnosis and appropriate treatment to avoid fatal consequences in the form of amputation. Trauma Vascular vessels can involve arteries and veins. Bleeding that is not detected or not controlled quickly will lead to the patient's death, or if there is ischemia, it will result in limb loss, stroke, necrosis, and multiple organ failure.<sup>1</sup>

Vascular trauma should be suspected in any trauma to the affected area anatomically traversed by large blood vessels. This condition is mainly in the case of injuries, stab wounds, low-velocity gunshot wounds, and blunt trauma

associated with fractures and dislocations. The severity of arterial trauma depends on the degree of invasiveness of trauma, mechanism, type and location of trauma, and duration of ischemia.<sup>1,2</sup>

Sharp cuts, blunt wounds, or iatrogenic cuts can cause vascular trauma. Vascular trauma often coexists with other organ trauma, such as nerves, muscles, and other soft tissues, or concomitant fracture or dislocation of the extremity. The form of vascular trauma is usually tangential or complete transection. Bleeding is more severe in incomplete arterial lesions, whereas Completely broken vessels will retract and constrict blood vessels to reduce or stop bleeding.<sup>1-3</sup>

Classically, the mechanism of trauma is divided into two, namely, sharp and blunt trauma. Blunt trauma to tissue caused by local compression or deceleration at

high speed. Tissue injury in penetrating trauma is caused by crushing and network separation. Understanding the biomechanics of a specific trauma will facilitate initial evaluation because trauma to the arteries is associated with several factors, namely the type of trauma, the location of the trauma, hemodynamic consequences, and trauma mechanism.<sup>1,4,5</sup>

Clinical symptoms displayed depend on the type of arterial trauma experienced. The most common types of trauma are partial lacerations and complete transactions. The entire transaction may result in retraction and thrombosis of the proximal end and distal vessels, leading to ischemia. Meanwhile, partial scratches may cause persistent bleeding or pseudoaneurysm formation. Partial lacerations, like contusions, can be accompanied by intima flaps, which

can lead to thrombosis. Small artery contusions with little intima flaps cannot cause a decrease in distal hemodynamics and, therefore, may not be diagnosed. The condition is referred to as occult or minimal arterial trauma when viewed from the angiography. These traumas carry a small risk of thrombosis and are often reversible spontaneously. Concomitant arterial and venous trauma can cause arteriovenous fistula formation.<sup>1,2</sup>

5% to 15% of the time, a normal pulse examination may be possible in the event of vascular injury. Generally, 3% to 25% of patients exhibiting mild signs sustain arterial injuries. In light of this, an arterial pressure index (API) or ankle-brachial index (ABI) to brachial-brachial index (BBI) is necessary in addition to the physical examination. Further imaging investigations are deemed superfluous when the index reaches 0.9, given that both the sensitivity and specificity exceed 95%. Arterial disease is more prevalent in the elderly, and these studies might be erroneous. The ABI/API of the contralateral limb is documented to accommodate this. Further imaging is required when the ABI/API of the injured extremity is equal to 0.1. Lynch and Johannsen identified the efficacy of API in their research. An API less than 0.90 demonstrated 87% sensitivity and 97% specificity in detecting arterial disruption compared to arteriography, according to the findings of this study. The sensitivity and specificity exhibited respective increases of 95% and 97% upon comparison with clinical outcomes. To localise the injury in stable patients who present with an anomalous physical exam or ABI/API, it is recommended to perform arteriography, CT arteriography, or duplex ultrasound.<sup>6</sup> Therefore, in this case, the report will discuss vascular trauma to the radial and ulnar arteries due to work accidents.

## CASE DESCRIPTION

A 19-year-old patient came with his colleague from the Emergency Department with the chief complaint of bleeding in his left hand. The patient experienced this while working on repairing electrical pipes an hour ago. The incident began when the electric cable fell from the power pole,



**Figure 1.** Degloving hand in vascular.

and then the car grabbed the power cable so that it wrapped around the patient's left hand, injuring the patient's hand and bleeding.

The general condition of the patient appeared to be moderately ill, body temperature 36.7 °C, blood pressure 110/70 mmHg, pulse rate 80x/minute, respiratory rate 24 x/minute, weight 73 kg, height 170 cm, normal nutritional status (body mass index 20.9 kg/m<sup>2</sup>). Examination of the head, ears, nose, mouth, neck, heart, and abdomen was within normal limits. However, radial and ulnar artery lacerations were found on the degloving hand (Figure 1).

The supporting examination was an X-ray of the upper extremity (Figure 2). Although the impression on the radiological examination was that the radial and ulnar bones looked good, there were soft tissue defects in the dorsal-lateral of the distal antebrachial. However, on laboratory examination, blood was within normal limits. The patient will then be admitted to the hospital and undergo vascular exploration and radial-radial bypass surgery with a saphenous vein graft using the great saphenous vein. The patient will come with the end-to-side anastomosis method. After the operation, a pulse examination of the radial artery shows a pulsation (+).



**Figure 2.** Radiology showed soft tissue defects in dorsal-lateral of the distal antebrachial.



**Figure 3.** Light therapy post-vascular exploration surgery and bypass radial-radial.

Postoperative management is when the patient is admitted to the ICU, and the patient's general condition and vital signs are monitored. The hand is positioned at an elevation of 30 degrees, and the vitality of the fingers is evaluated every day. Pharmacological management has given Ringel lactate (RL) 20 drops/ minute, an injection of ceftriaxone 1 gram /12 hours, a ketorolac 30 mg/ 8 hours IV, and Heparin 700 units/ hour. Then, check PT and APTT after 6 hours postoperatively. The patient was also treated with light therapy

to improve vascularity at the surgical site (figure 3).

## DISCUSSION

Vascular trauma should be suspected in any trauma to the affected area anatomically traversed by large blood vessels. This condition is mainly in the case of injuries, stab wounds, low-velocity gunshot wounds, and blunt trauma associated with fractures and dislocations. The severity of arterial trauma depends on the degree of invasiveness of trauma, mechanism, type and location of trauma, and duration of ischemia.<sup>7,8</sup>

Clinical features of arterial trauma may include external bleeding, ischemia, pulsatile hematoma, or internal bleeding with signs of shock. Clinical symptoms, including the most common cause of extremity arterial trauma, are acute ischemia. Signs of ischemia are persistent pain, paresthesia, paralysis, pallor, and poikilothermia. Inspection A complete physical examination, including assessment, palpation, and auscultation, is usually sufficient to identify signs of acute ischemia. Presence of vascular trauma Extremities can be determined by looking at the signs and symptoms experienced by the patient. Signs and symptoms are in the form of rigid signs and soft signs.<sup>1-3</sup>

All trauma patients with significant and symptomatic mechanisms' soft signs should be evaluated for distal circulation. One practical way is with the ABI (ankle-brachial index). If  $ABI < 1$ , it indicates the presence of arterial trauma. The presence of a pseudoaneurysm or arteriovenous fistula should be considered in A case of penetrating extremity trauma found pulsatile hematoma accompanied by bruits or thrill.<sup>4,5,9</sup>

The presence of signs of vascular trauma with an open fracture is an indication that should be explored to determine the presence of vascular trauma. The difficulty for Diagnosing vascular trauma is common in large hematomas at fractures closed bones. Another sign that can accompany vascular trauma is the presence of a deficit neurological, both sensory and motor, such as numbness and decreased motor strength in the extremities. Inadequate blood flow can lead to hypoxia, making the extremities appear pale and cold

to the touch. Capillary refill does not describe the state of circulation because it can originate from the collateral arteries; however, it is important for determining network viability.<sup>1-3</sup>

Diagnosis can use supporting tools such as pulse oximetry, Doppler ultrasound, or duplex ultrasound to determine vascular lesions, but the results are unsatisfactory. In addition, intra-operative arteriography helps know the reconstruction results directly, whether there are still lesions in the vasculature.<sup>5,10</sup>

The sooner the action, the better the outcome. If heavy bleeding and gushing endanger the life, first aid is to stop the bleeding while the definitive action is performed after the bleeding has stopped. Bleeding is treated with emphasis on the above bleeding area. Installation of a tourniquet should not be done because it can damage the damaged collateral system. The golden period for vascular lesions is 6-12 hours. Obvious signs of ischemia are usually seen on the skin, but muscles and nerves are more resistant to ischemia.<sup>1,4,9</sup>

Management of minimal and asymptomatic arterial injury remains controversial. Some surgeons insist that all detected arterial damages must be repaired. In contrast, others propose non-operative actions if there are criteria for clinical and radiological conditions such as low-velocity injury, minimal arterial wall disruption ( $<5\text{mm}$ ) in intimal abnormalities and pseudoaneurysms, no active bleeding, and distal circulation is intact. This approach can be performed on arteries with collateral, especially in young people, if a non-operative method is recommended to perform vascular imaging to monitor healing or stabilisation.<sup>1</sup>

Surgical management of peripheral arterial injuries requires complete preparation for injured extremities. In addition, a healthy person's contralateral upper or lower extremities should be included to anticipate the need for a venous autograft. In general, the incision is made longitudinally directly into the vessel involved injured and extended proximally or distally as needed.<sup>10</sup>

Proximal and distal arterial control was performed before exposure to the injury. The proximal artery is controlled

with a coarse thread wrapped around the artery (like a noose) or, if necessary, using vascular clamps. It is also performed on the distal artery.<sup>9</sup>

The mode of arterial reconstruction depends on the extent and mechanism of trauma. Repair Vascular injuries can be performed with lateral suture patch angioplasty, end-to-end anastomosis, interposition graft, and bypass graft. An extra-anatomic bypass graft is useful in patients with extensive soft tissue injury or sepsis. Grafts are needed to prevent constriction or stress on the blood vessel anastomosis if the arterial loss is more than 1.5 cm. In general, autogenous vein grafts are preferred for treating vascular problems.<sup>2,3,10</sup>

In vascular trauma accompanied by venous damage, reconstruction alone or in conjunction with damage to the arterial system can be done. Perform a vein connection first after removing the thrombus, especially in the central vein, while the smaller veins can be tied alone. This can help reduce postoperative edema and amputation rates in vascular trauma patients with severe soft tissue and bone damage and helps improve arterial flow.<sup>4,8</sup>

In vascular trauma accompanied by a bone fracture, limiting it to 12 hours of trauma is recommended. Arterial repair should be performed first if it is more than 12 hours. External fixation must first be carried out to treat this fracture, especially in lower extremity fractures, because soft tissue damage usually accompanies the lower extremities.<sup>1,5,10</sup>

The most critical factor determining the prognosis of therapy in limb trauma at the time of treatment is the presence of trauma, crushing damage, poor vascular repair obstruction, and segmental fracture of the tibia. In trauma, crushing damage usually occurs with severe tissue damage that rapidly undergoes necrosis. As a result, the patient will suffer the loss of a limb even though the blood vessels are functioning correctly. Whereas fracture of the proximal tibia and repair of blood vessels can be rapidly handled, the results will be much more satisfactory.<sup>2,3</sup>

In this case, the patient underwent vascular exploration and radial-radial bypass with an end-to-side anastomosis method using the great saphenous vein



from the left cruris. The operation is performed under general anesthesia. The patient was admitted to the Intensive Care Unit (ICU) postoperatively, and the radial artery pulse was good. Furthermore, the patient was observed with recommendations for monitoring the patient's general condition, postoperative hand position elevation of 300, and routine finger vitality checks every day. Pharmacological management has given RL 20 drops/ minute, an injection of ceftriaxone 1 gram /12 hours, ketorolac 30 mg/ 8 hours IV, and Heparin 700 units/ hour. Then, check PT and APTT after 6 hours postoperatively. The patient was also treated with light therapy to improve vascularity at the surgical site.

This case report focuses on managing vascular injury, so it is hoped that it can become a guideline or reference for managing similar cases. However, the weakness of this study is that it focuses only on therapy and does not show regular evaluation of the condition.

## CONCLUSION

Based on the discussion above, the key to managing vascular trauma is the appropriate response and treatment. The 6-12 hours is the golden period, which is the key to successful management of vascular trauma. In vascular trauma accompanied by venous damage, reconstruction can be performed alone or in conjunction with damage to the arterial system. However, it is preferable to perform a vein connection first after the thrombus due to trauma has been removed to reduce postoperative edema and amputation rates in vascular trauma patients. The ultimate goal of

reconstruction in vascular trauma is to reduce amputation rates. To prevent this, we can, as soon as possible, recognise and provide treatment preoperative and intraoperative arteriography is considered as good as possible, Performing thrombectomy to the proximal and distal, Appropriate use of heparin, and Prioritizing autogenous veins as grafts.

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This article has no conflict of interest, and all funding does not involve a specific sponsor or brand.

### Author Contribution

All authors are involved and took part in making this article. The first author contributed to drafting and designing this manuscript. The second author provides conceiving, designing and supervising the manuscript.

### Inform Consent

The patient has agreed that the case will be published, and the identity will be kept confidential.

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