

Subclavian artery rupture in a young man during excessive weight lifting

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We report a 19-year-old man with rupture of the right subclavian artery after an excessive exercise of weight lifting. Imaging showed a hemothorax and hematomediastinum, a pseudoaneurysm with a maximum diameter of 4 cm, and a dissection of the right vertebral artery. As an emergency procedure an interposition graft was performed for reconstruction of the right subclavian artery. The patient's postoperative course was uneventful, and he was symptom free except for regressive hoarseness due to a paresis of the right recurrent laryngeal nerve. (*J Vasc Surg Cases* 2015;1:194-6.)

A 19-year-old man presented with rupture of the right subclavian artery after an excessive exercise of weight lifting. Imaging showed a hemothorax and hematomediastinum, a pseudoaneurysm with a maximum diameter of 4 cm, and a dissection of the right vertebral artery. As an emergency procedure an interposition graft was performed for reconstruction of the right subclavian artery. The consent of the patient was obtained to publish this case report.

CASE REPORT

A 19-year-old man presented at a peripheral hospital because of pain in the right shoulder after an excessive exercise of weight lifting. Initially he suffered from a dysesthesia in the fingers of the right hand. The examination revealed normal pulses and no signs of ischemia. His medical history revealed no previous diseases, in particular, there was no history of hypertension and no previous drug consumption. X-ray imaging of the right shoulder showed no signs of fracture. Ultrasound imaging showed fiber rupture of the sternocleidomastoid muscle and a small hematoma.

The patient was admitted for observation and analgesic therapy. He was discharged the day after, but in the evening of the same day he reappeared at the outpatient clinic, now with acute dyspnea and an increase of pain. Chest X-ray imaging showed a right-sided hemothorax. A computed tomography scan revealed a ruptured right subclavian artery with development of a pseudoaneurysm with a 4-cm diameter. The right vertebral artery was

occluded, and a hemothorax and hematomediastinum was detected (Fig 1 and 2).

The patient was transferred to our hospital, and his vital signs were stable during the duration of transport. At admission, systolic blood pressure on the right upper extremity was 110 mm Hg compared with 150 mm Hg on the left upper extremity. His weight was 88 kg with a height of 180 cm. On both upper extremities pulses were present and were slightly alleviated on the right side compared with the left side. Oscillographic examination at admission showed reduced amplitudes on the right upper extremity compared with normal amplitudes on the left side.

Endovascular therapy was considered but rejected because of the proximity of the lesion, the young age of the patient, and the unknown etiology. The patient was transferred directly to the operating theater.

After the operating field was prepared for a supraclavicular incision and for an upper median sternotomy, a supraclavicular approach was performed. The scalene muscles were divided to control the distal subclavian artery. The innominate artery and the common carotid artery were prepared. Rupture of the false aneurysm occurred during preparation, the recurrent laryngeal nerve was not visualized. After heparin administration and short-term clamping of the innominate and the carotid artery, the proximal stump of the subclavian artery could be prepared, and the clamp was shifted to this artery.

A complete transection of the right subclavian artery was identified. The subclavian artery was reconstructed by interposition of an 8-mm Dacron (FlowNit BIOSEAL; Jotec, Hechingen, Germany) graft. Owing to a dissection of the right vertebral artery without retrograde flow, the reconstruction was completed without a reanastomosis of the vertebral artery. A chest tube was placed at the right thoracic cavity.

The patient's perioperative course was uneventful, and no blood transfusions were necessary. No neurologic signs associated with the dissected vertebral artery were noticed, and oscillographic examination of the right upper extremity revealed normal amplitudes. Parts of the resected arterial wall were sent for histopathologic examination, and a mucoid degeneration of the media with low-grade arteriosclerotic changes was described.

A computed tomography scan on the third postoperative day showed a patent interposition graft and a regression of the

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Author conflict of interest: none.

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2352-667X

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<http://dx.doi.org/10.1016/j.jvsc.2015.04.012>

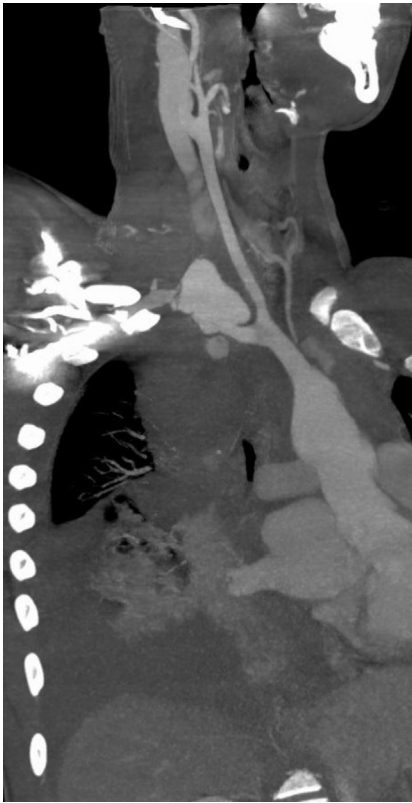


Fig 1. Reconstructed computed tomography image shows the ruptured right subclavian artery and the development of a pseudoaneurysm with a 4-cm diameter.

hematothorax (Fig 3). The patient complained about hoarseness, and an otolaryngologist's examination showed a paresis of the right recurrent laryngeal nerve. An intraoperative injury of the recurrent laryngeal nerve was supposed, and logopedic therapy was started. Platelet inhibition therapy with aspirin (100 mg/d) was started, and the patient was discharged 9 days after surgery.

Precise patient history record pointed out that the patient had been lifting weights during the past 18 months and during that time he gained 20 kg of body weight. He assured that he never used anabolic steroids, neither orally nor by injection, and only used food supplements containing proteins, additional amino acids, such as branched-chain amino acids, and creatine. The exercise that led to the vascular trauma is named "dead lift," which means lifting a bar, in our case with a weight of 170 kg, by extending hips and knees to full extension.

Because of the patient's young age, the untypical injury, and the result of the histologic examination, investigations were initiated to exclude genetic connective tissue disorders; however, patient history, family history, clinical examination, echocardiography, and genetic testing of chromosomal aberrations related to Marfan syndrome and Ehlers Danlos syndrome did not show any pathologic findings.

A magnetic resonance angiography after 6 months showed a patent interposition graft. An oscillographic examination revealed normal amplitudes on both upper extremities. The patient was



Fig 2. Computed tomography scan (transverse plane) shows right-sided hemothorax and hematomediastinum.

symptom-free, except for mild hoarseness with partial improvement during logopedic therapy. Against our recommendations, he restarted bodybuilding 6 months after the injury. Owing to the uncommon history of the young patient and the low-grade arteriosclerotic changes, antiplatelet therapy with aspirin (100 mg/d) was prescribed for another 6 months.

DISCUSSION

Traumatic rupture of the subclavian artery is a rare clinical entity that most frequently appears after blunt or penetrating trauma with a combination of nerve, muscle, and bone injuries. Gottschalk et al¹ published a retrospective analysis of 2971 patients with injuries of the shoulder. The incidence of great vessel injuries was 3.9%, and their report suggests that in all nonorthopedic injuries, great vessel injuries carry the highest mortality rate.¹ Chronic pathologic lesions of the proximal axillary or subclavian artery might be caused by sporting activities such as baseball or overhead sports.²⁻⁴ In our case, the injury occurred in a young patient after weight lifting, and to our knowledge, this is the first described case with this etiology.

There are only few case reports of vascular injuries related to athletic sports. Hatzaras et al⁵ report a series of 31 acute aortic dissections occurring in the setting of weight lifting; of these, 87.1% presented with an ascending type A dissection and the over-all mortality was 32.3%. Their report reveals a correlation between the pre-existing enlargement of the aorta and a dramatic elevation of systolic blood pressure of up to 300 mm Hg in the setting of weight lifting.⁵ Mayerick et al⁶ confirmed this theory and recommend for individuals with known aortic dilation a program that limits their weight lifting to 50% of their body weight in bench press. Another impressive case of spontaneous coronary artery dissection in a 23-year-old male professional body builder was described by Aghasadeghi and Aslani⁷ in 2008.

In patients with genetic connective tissue disorders, such as Marfan syndrome, rupture of affected arteries due to pathologic transformation of the vessel wall may occur in combination with an increased blood pressure during



Fig 3. Reconstructed computed tomography image shows the patent interposition graft.

weight lifting so that the risk of fatal vascular complications is increased.⁸⁻¹⁰ That the use of legal food supplements, such as branched-chain amino acids or creatine, might lead to acute renal failure, vascular complications, such as

rupture, or dissection is not described in the current literature, and there is no correlation to mucoid degeneration of the media in combination with these food supplements.¹¹

CONCLUSIONS

Vascular injuries due to weight lifting are very rare, but especially in patients with increased aortic diameter or suspected vascular pathologies, a systematic screening is recommended.

REFERENCES

1. Gottschalk HP, Browne RH, Starr AJ. Shoulder girdle: patterns of trauma and associated injuries. *J Orthop Trauma* 2011;25:266-71.
2. De Mooij T, Duncan AA, Kakar S. Vascular injuries in the upper extremity in athletes. *Hand Clin* 2015;31:39-52.
3. Ligh CA, Schulman ML, Safran MR. Unusual cause of shoulder pain in a collegiate baseball player. *Clin Orthop Relat Res* 2009;467:2744-8.
4. Reeser JC. Diagnosis and management of vascular injuries in the shoulder girdle of the overhead athlete. *Curr Sports Med Rep* 2007;6:322-7.
5. Hatzaras I, Tranquilli M, Coady M, Barrett PM, Bible J, Elefteriades JA. Weight lifting and aortic dissection: more evidence for a connection. *Cardiology* 2007;107:103-6.
6. Mayerick C, Carré F, Elefteriades J. Aortic dissection and sport: physiologic and clinical understanding provides an opportunity to save young lives. *J Cardiovasc Surg (Torino)* 2010;51:669-81.
7. Aghasadeghi K, Aslani A. Spontaneous coronary artery dissection in a professional body builder. *Int J Cardiol* 2008;130:119-20.
8. Berrouschof J, Bormann A, Routsis D, Stoll A. Sports-related carotid artery dissection. *Fortschr Neurol Psychiat* 2009;77:528-31.
9. Hogan CJ. An aortic dissection in a young weightlifter with non-Marfan-fibrillinopathy. *Emerg Med J* 2005;22:304-5.
10. Gwan-Nulla DN, Davidson WR, Grenko RT, Damiano RJ. Aortic dissection in a weight lifter with nodular fasciitis of the aorta. *Ann Thorac Surg* 2000;69:1931-2.
11. Thorsteinsdottir B, Grande JP, Garovic VD. Acute renal failure in a young weight lifter taking food supplements, including creatine monohydrate. *J Ren Nutr* 2006;16:341-5.

Submitted Mar 4, 2015; accepted Apr 30, 2015.