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Acute subclavian steal syndrome following blunt thoracic trauma

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A rare case of acute subclavian steal syndrome following blunt thoracic trauma is described. By aortography, obstruction of the origin of the left subclavian artery was found and the reversed flow through the vertebral artery was demonstrated. This injury was successfully treated by an aortosubclavian bypass Dacron prosthesis using a left posterolateral thoracotomy approach.

Injury of the subclavian artery following trauma is an uncommon finding. Hughes (1958) reported 304 vascular injuries in Korean war casualties but in only three of these was rupture of the subclavian artery documented.

Chandler and Knapp (1967) reported the operative repair of 126 vascular injuries in 118 casualties in Vietnam. Only one subclavian artery injury was found, an incidence of 0·8%.

The reported experience with civilian injuries of the subclavian artery is limited. Carlsson and Silander (1963) described two cases of right traumatic subclavian aneurysm. Brawley, Murray, Crisler, and Cameron (1970), reporting 20 injuries involving the great vessels arising from the aortic arch, found 12 subclavian lesions. DeMeules, Cramer and Perry (1971) described 15 injuries of the aortic arch and great vessels. Two subclavian lacerations were reported in this group.

We report a case of acute subclavian steal syndrome following blunt thoracic trauma treated by aortosubclavian Dacron bypass prosthesis.

CASE REPORT

On 16 February 1971 a 36-year-old woman was crushed between two buses, one stationary, the other moving slowly. An initial short period of unconsciousness was noted but on admission to hospital she was fully conscious and complaining of left-sided upper anterior chest pain with pain over the upper thoracic vertebrae, radiating into the neck.

Examination of peripheral arterial pulses at this time revealed weakness of the left radial pulse as compared with the right. A chest radiograph (Fig. 1) showed a broad superior mediastinum. She was transferred to our unit as a case of possible ruptured aorta.

On admission the following findings were elicited: good general physical condition; swelling of the left side of the neck; no evidence of brachial plexus injury; bruising over the upper part of the sternum. All arterial pulses in the left arm were impalpable. There was no evidence of associated injuries.

On admission a postero-anterior chest radiograph (Fig. 2) showed no widening of the left superior mediastinal shadow. There was a small left apical effusion. No fractures were noted. Injury to the subclavian artery was diagnosed.

A preoperative aortic arch angiogram was performed on 18 February 1971. A catheter was introduced through a small arteriotomy incision in the right brachial artery and advanced into the aortic arch. The aortogram showed a complete obstruction of the left subclavian artery about 2 cm from its origin (Fig. 3). There was delayed retrograde filling of the left vertebral and subclavian arteries (Fig. 4). The obstructed segment was approximately 2·5 cm in length and its appearance suggested thrombosis of the subclavian artery.

On 22 February 1971, operation was carried out through a left posterolateral thoracotomy through the fourth intercostal space. There was a subpleural haematoma over the left subclavian artery. The intrathoracic portion of the artery was mobilized after dividing the mediastinal pleura behind the vagus nerve. There was a complete segmental obstruction of the left subclavian artery about 2 cm from its origin. The wall of the artery was thin and bruised and the periarterial thrombus was firmly adherent to the damaged vessel.

The affected area was bypassed using a 10 mm diameter woven Dacron arterial prosthesis which passed from the aortic arch to the subclavian artery distal to the obstruction. The chest wall was closed

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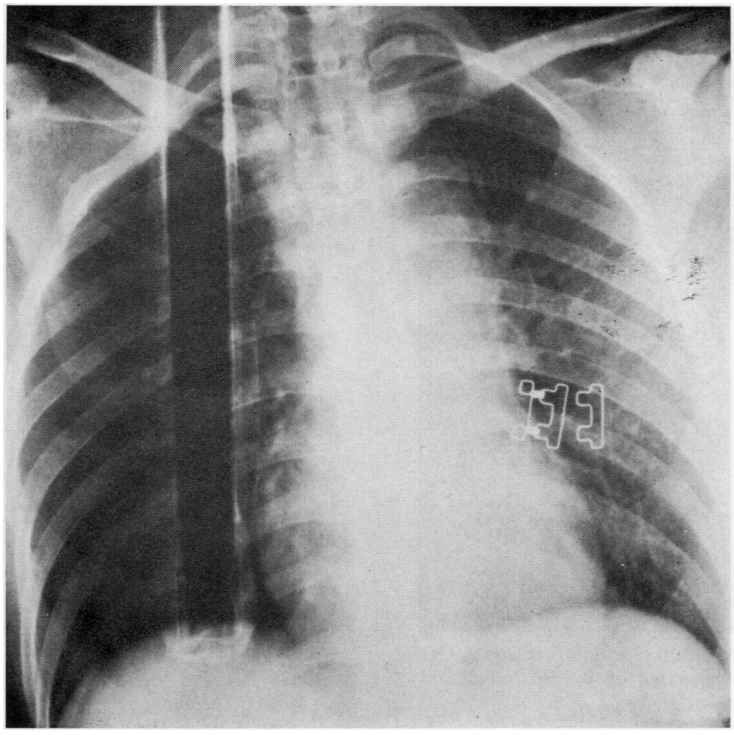

FIG. 1. *Postero-anterior chest radiograph taken shortly after the injury. The superior mediastinum is broadened.*

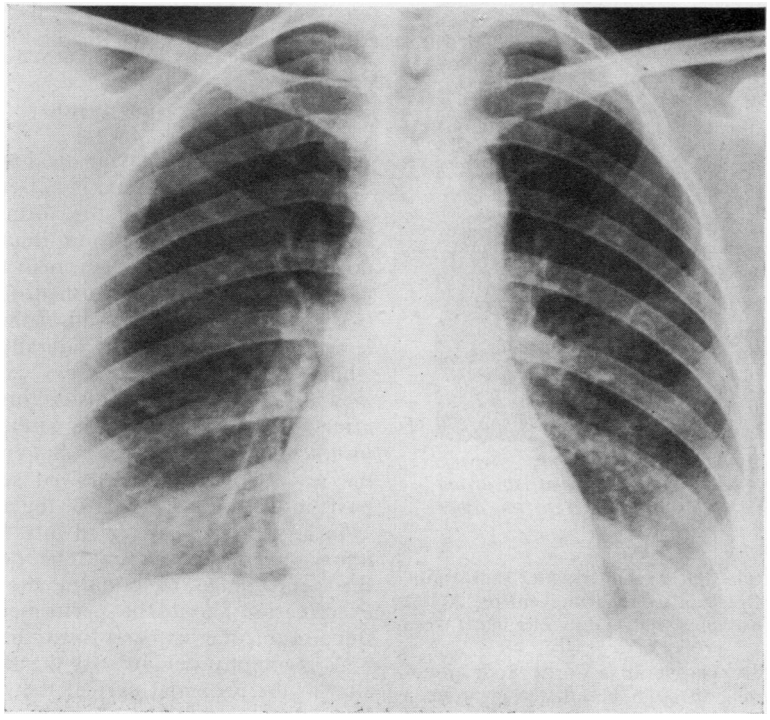

FIG. 2. *Postero-anterior chest radiograph on admission to the thoracic unit. The mediastinum is not broadened. There is a small left apical effusion.*

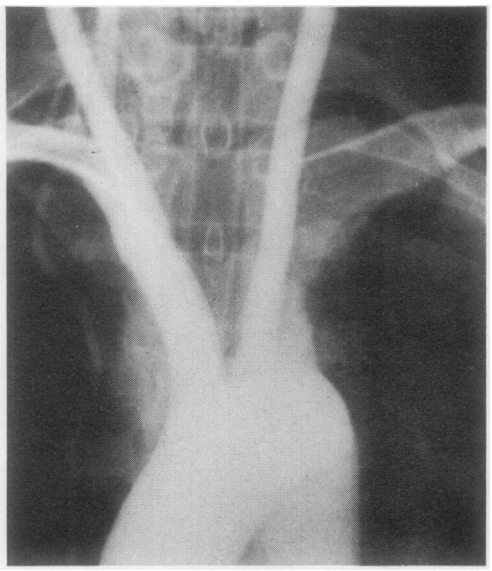

FIG. 3. *Preoperative aortogram* (18 *February*, 1971) *shows complete obstruction of the left subclavian artery about* 2 *cm from its origin.*

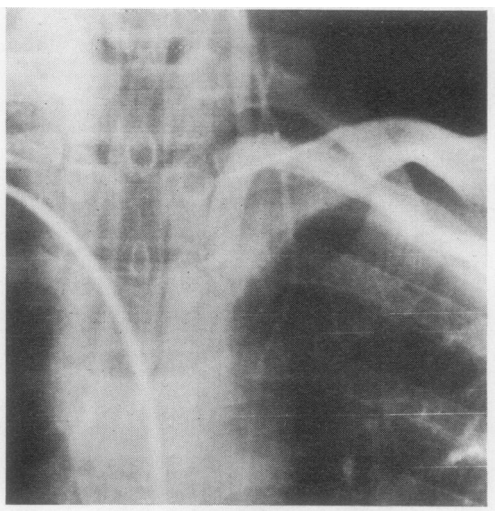

FIG. 4. *Same preoperative aortogram showing retrograde filling of the left vertebral and subclavian arteries after clearing of contrast from the other major vessels.*

and an intercostal tube left for underwater seal drainage. The postoperative course was uneventful. A left radial artery pulse was present. No anticoagulants were used.

On 8 March 1971 postoperative aortic arch angiography was performed through a catheter introduced by the Seldinger technique through the right femoral artery. This showed patency of the bypass graft, and the distal subclavian artery was demonstrated filling at the same time as the left carotid artery (Fig. 5).

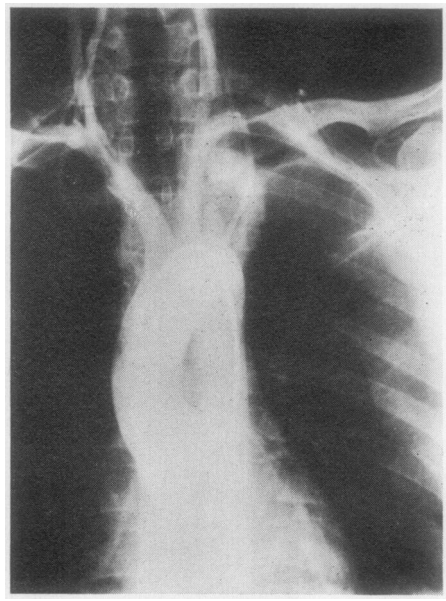

FIG. 5. *Postoperative aortogram* (8 *March*, 1971). *The left subclavian artery outlines at the same time as the other major branches of the aorta.*

DISCUSSION

A case of acute subclavian steal syndrome following blunt thoracic trauma is presented.

Traumatic rupture of the aorta usually follows an acceleration–deceleration injury. This could not have been the mechanism in this patient. The patient's left chest was crushed obliquely between two buses: the anterior wall of the thorax and the left shoulder were pushed laterally and backwards while the posterior thoracic cage was pushed medially and forwards, distracting the subclavian artery from the arch. The stretching force was insufficient to tear the vessel but enough to damage the wall. Obstruction followed secondary thrombosis in the damaged part of the artery.

In any case of suspected intrathoracic vascular injury aortography should be performed during the acute stage to confirm the diagnosis. The examination should be performed without introduction of the catheter into the injured vessel.

Aortography demarcated the site of the occlusion in the proximal part of the subclavian artery and demonstrated a length of intrathoracic

vessel distal to the obstruction suitable for a graft. The transthoracic approach to the lesion was preferred as it was the most direct, and allowed inspection of the lesion and the opportunity to bypass the obstruction without the need for a period of carotid artery occlusion that would have been necessary if the cervical approach had been used to insert a carotid-subclavian bypass graft.

By using a bypass prosthesis as described, the suture line at either end was to healthy undamaged tissue. Furthermore, a larger diameter (10 mm) graft could be used and the risk of subsequent thrombotic occlusion of the prosthesis was minimized.

In this case we think that thrombectomy was contraindicated because the arterial wall was damaged and there was the possibility of rethrombosis after removing the obstructing thrombus.

Many workers (Rojas, Levitsky and Stansel, 1966; Brawley *et al.*, 1970) have previously described Dacron prosthesis replacement of the injured portion of the left subclavian artery. This method was unsuitable as the damage to the subclavian wall extended up to the arch of the aorta.

In conclusion, when radiographic evidence of the subclavian steal was demonstrated, early surgery was indicated to prevent the development of neurological symptoms when the patient returned to normal activities. The surgical approach chosen allowed examination of the lesion.

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