SUPPLEMENTAL MATERIAL

Marie Cerna, Martin Kocher, Rohit Philip Thomas. Acute aorta, overview of acute CT findings and endovascular treatment options (doi: 10.5507/bp.2016.060)

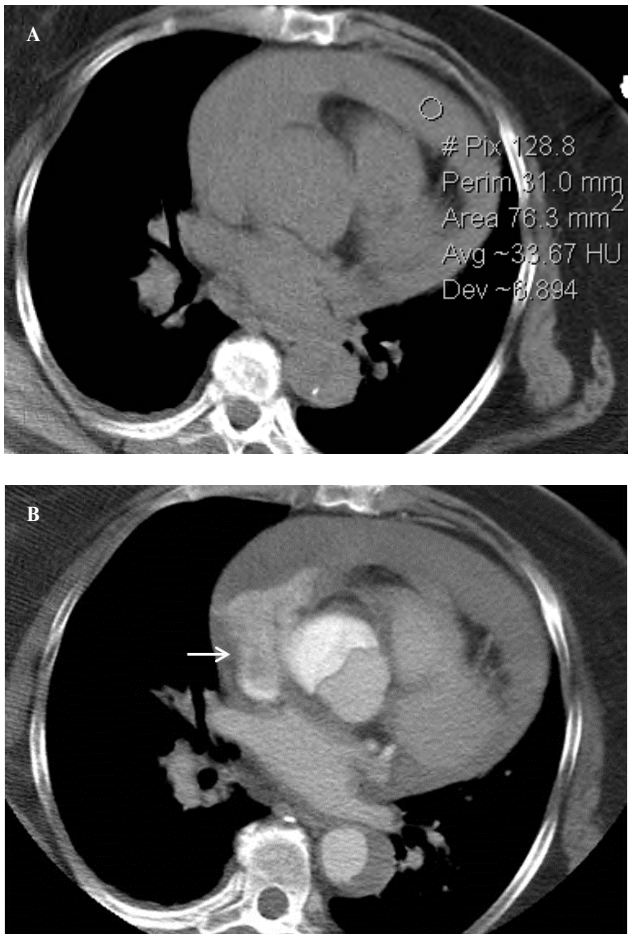


Fig. 1. A: Non-enhanced CT, hemopericardium (density 33 HU), **B**: CT angiography, acute dissection Stanford A, hemopericardium, active bleeding (rupture of dissected aorta) to pericardium (→).

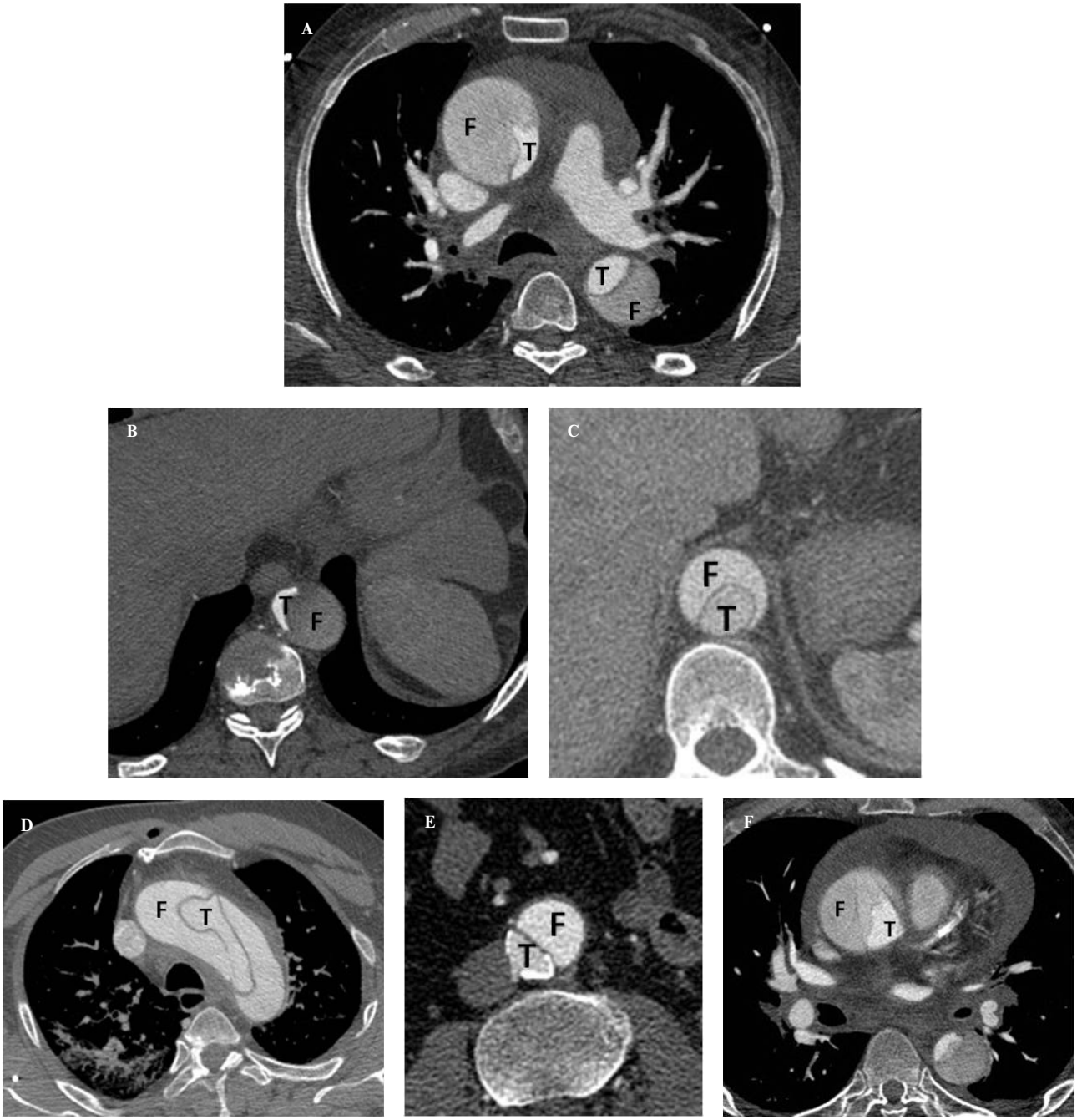


Fig. 2. CT angiography, acute aortic dissection type A. A: True lumen is compressed, larger false lumen with delayed enhancement. B: Compressed true lumen. C: Beak sign. D: True lumen inside false lumen, aortic arch. E: Calcification of aortic wall inside true lumen. F: Cobweb sign in false lumen.

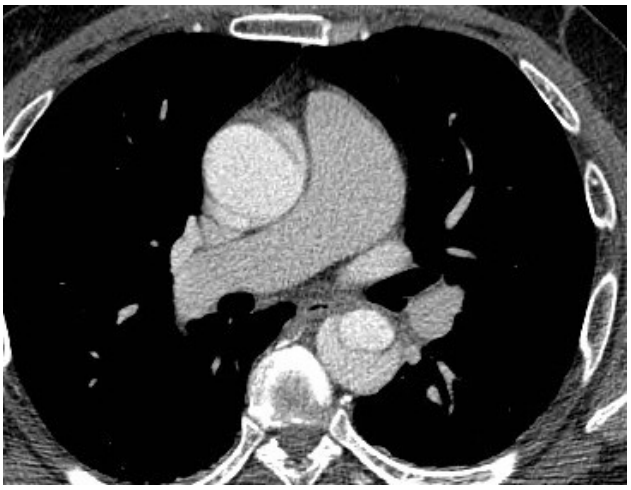


Fig. 3. Motion artefacts on ascending thoracic aorta.

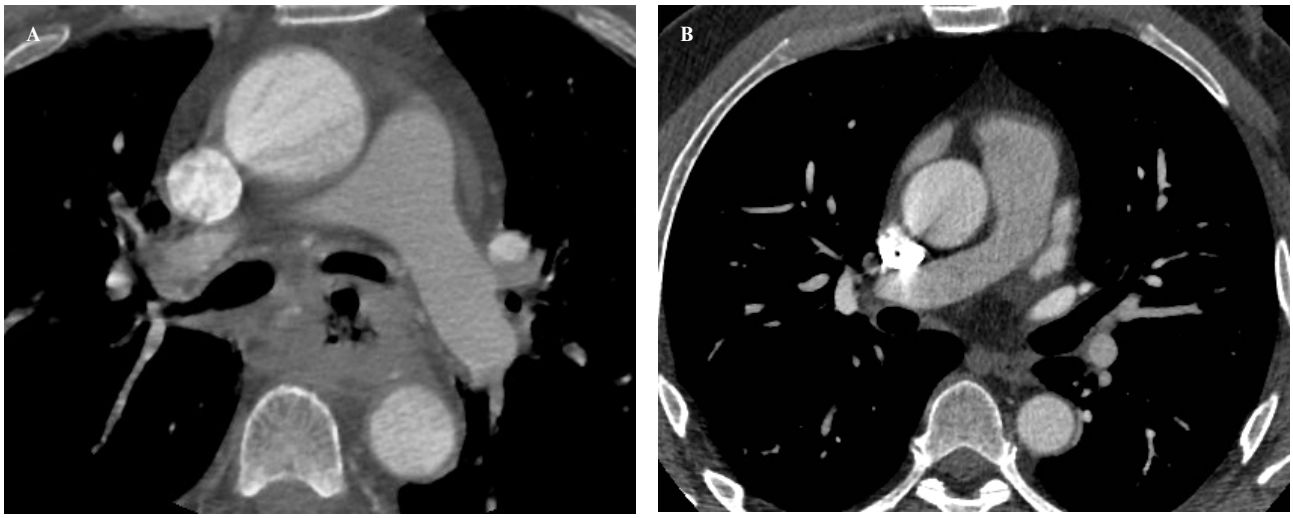


Fig. 4 A, B. Artefacts from contrast medium.

Fig. 5. A: Unenhanced CT. IMH A, hyperdense circular wall thickening of ascending thoracic aorta. **B:** CT angiography. IMH A, circular wall thickening.

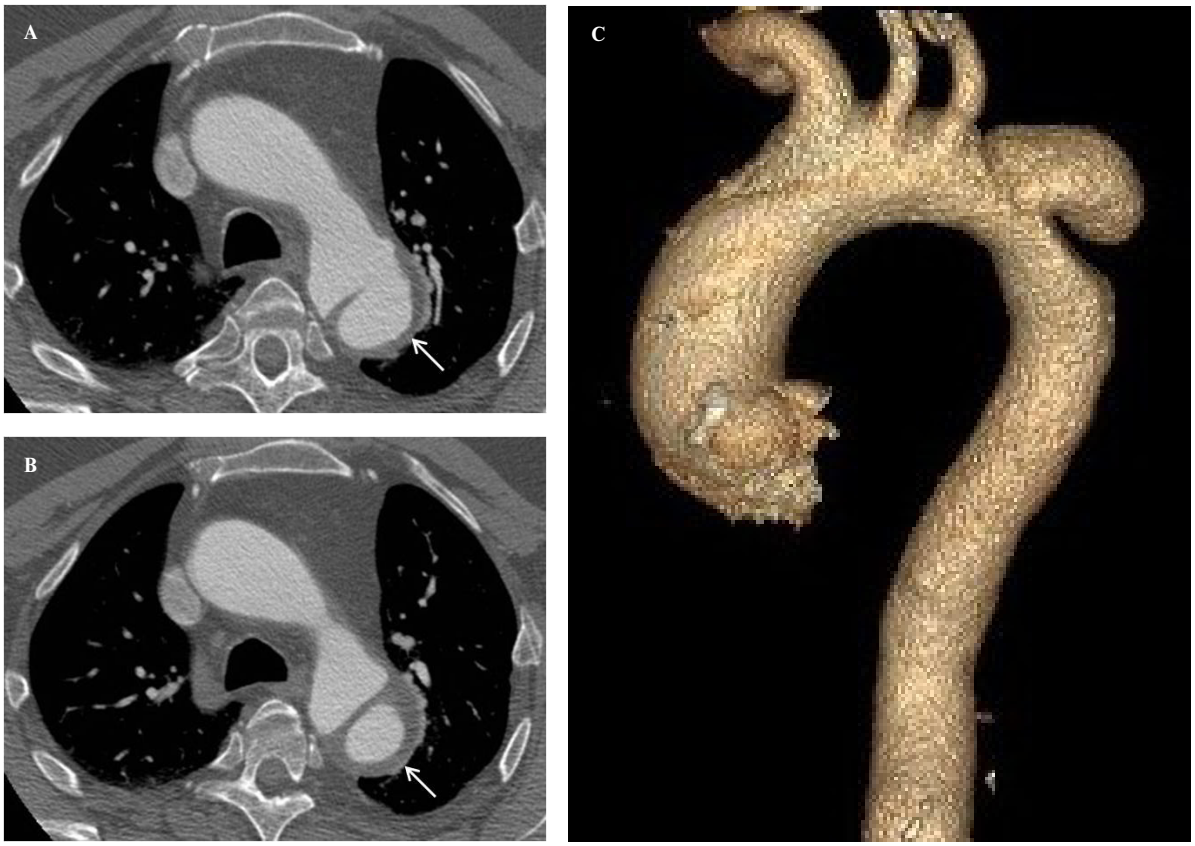


Fig. 6. A, B: Follow-up CT angiography 6 months after IMH B. Pseudoaneurysm of aortic isthmus (→). **C:** 3D VRT reconstruction of thoracic aorta, pseudoaneurysm of aortic isthmus.

Fig. 7. CT angiography of thoracic aorta, penetrating aortic ulcer of ascending aorta (→).

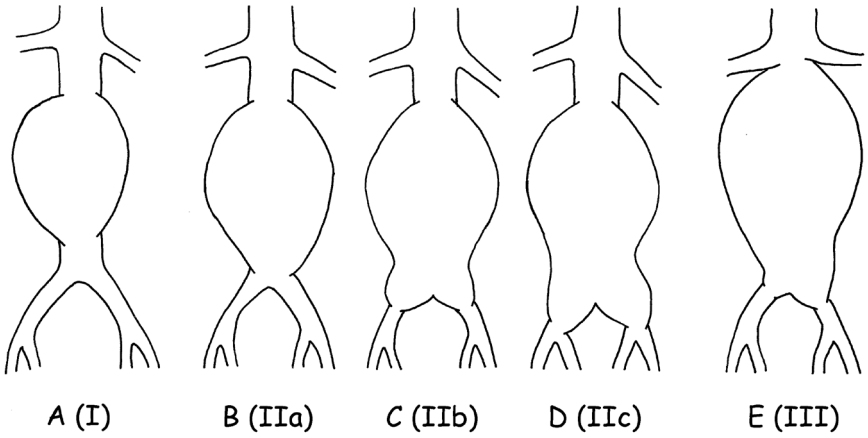


Fig. 8. Classification of abdominal aortic aneurysm - EUROSTAR/Schumacher.

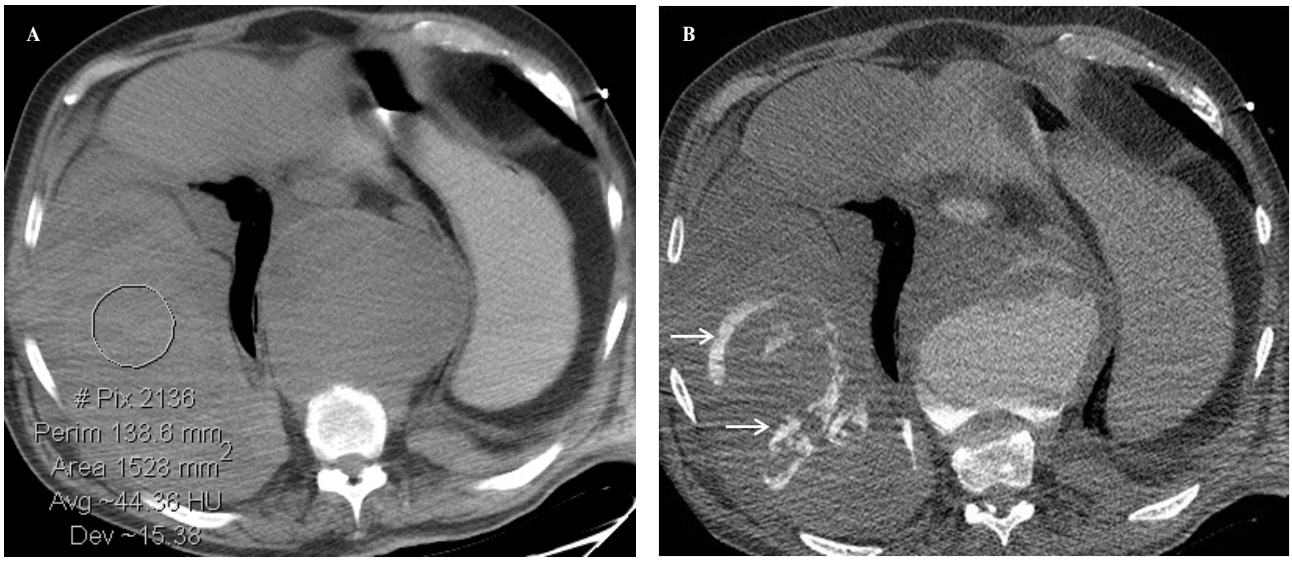


Fig. 9. A: Unenhanced CT of thorax, aneurysm of descending thoracic aorta, hemothorax with density 44 HU. **B:** CT angiography, ruptured thoracic aneurysm, active bleeding with contrast leakage to pleural cavity (→).

Fig. 10. Unenhanced CT of abdomen - ruptured AAA, heterogeneous hyperdense retroperitoneal hematoma.

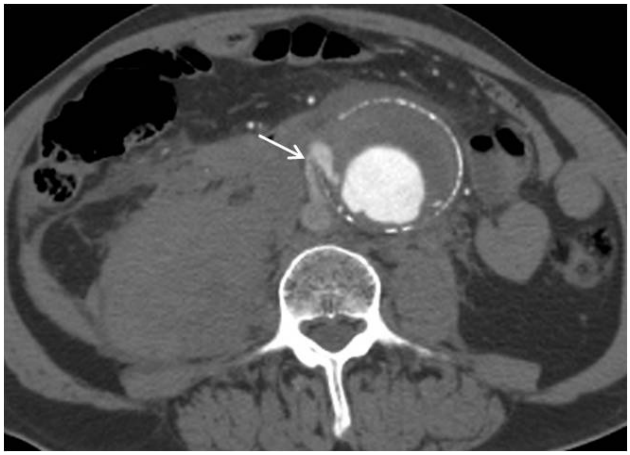


Fig. 11. CT angiography, ruptured AAA, active bleeding (→), contrast leakage to retroperitoneal cavity.

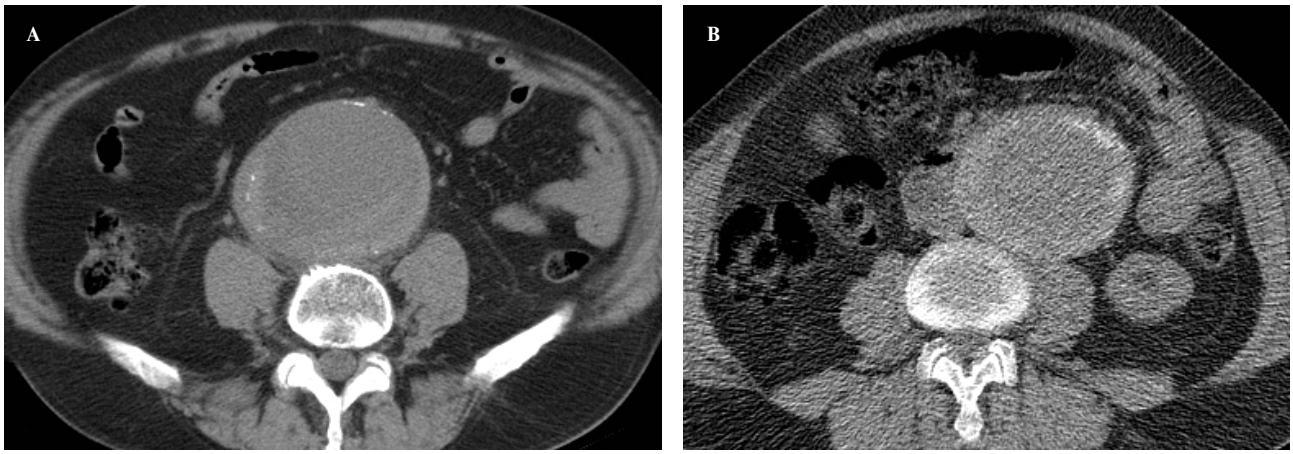


Fig. 12. Unenhanced CT, AAA, crescent sign, hyperdensity inside aneurysm wall. **A:** Crescent shape, dorsolateral. **B:** Circular wall hyperdensity.

Fig. 13. CT angiography of abdominal aorta with AAA, stranding of retroperitoneal fat (→).

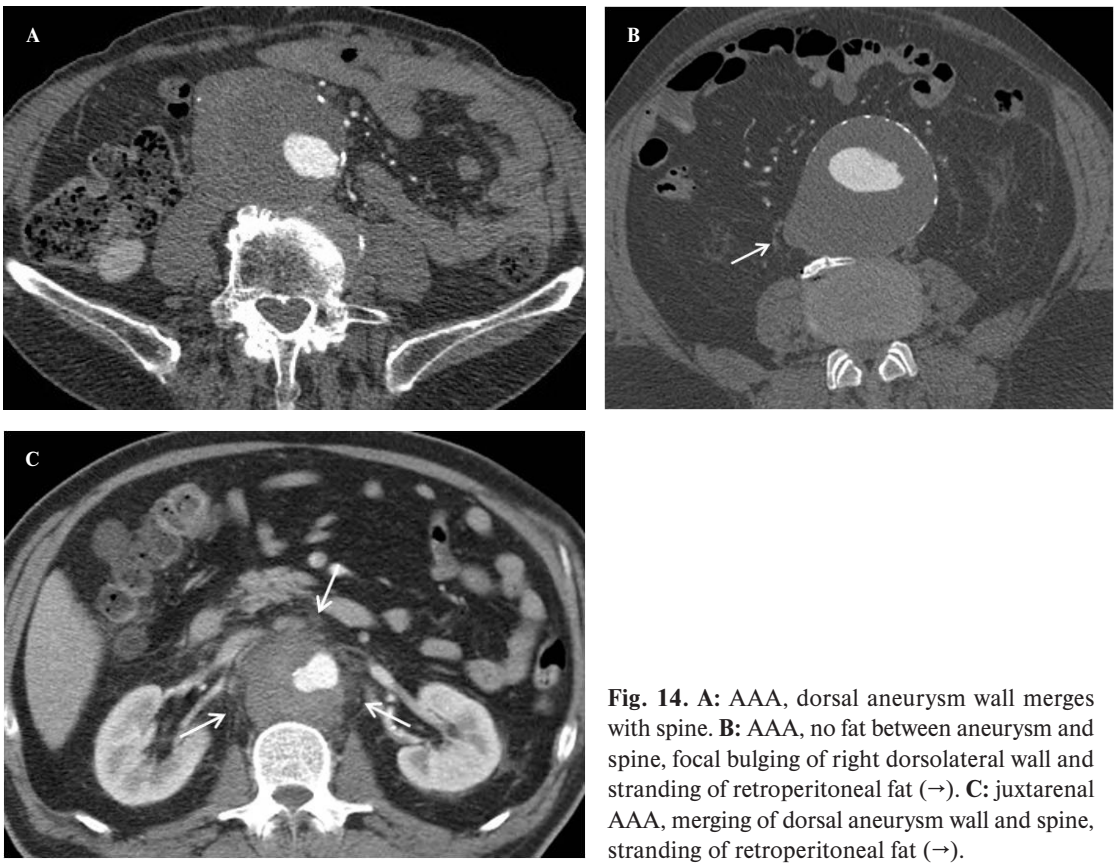


Fig. 14. A: AAA, dorsal aneurysm wall merges with spine. **B:** AAA, no fat between aneurysm and spine, focal bulging of right dorsolateral wall and stranding of retroperitoneal fat (→). **C:** juxtarenal AAA, merging of dorsal aneurysm wall and spine, stranding of retroperitoneal fat (→).

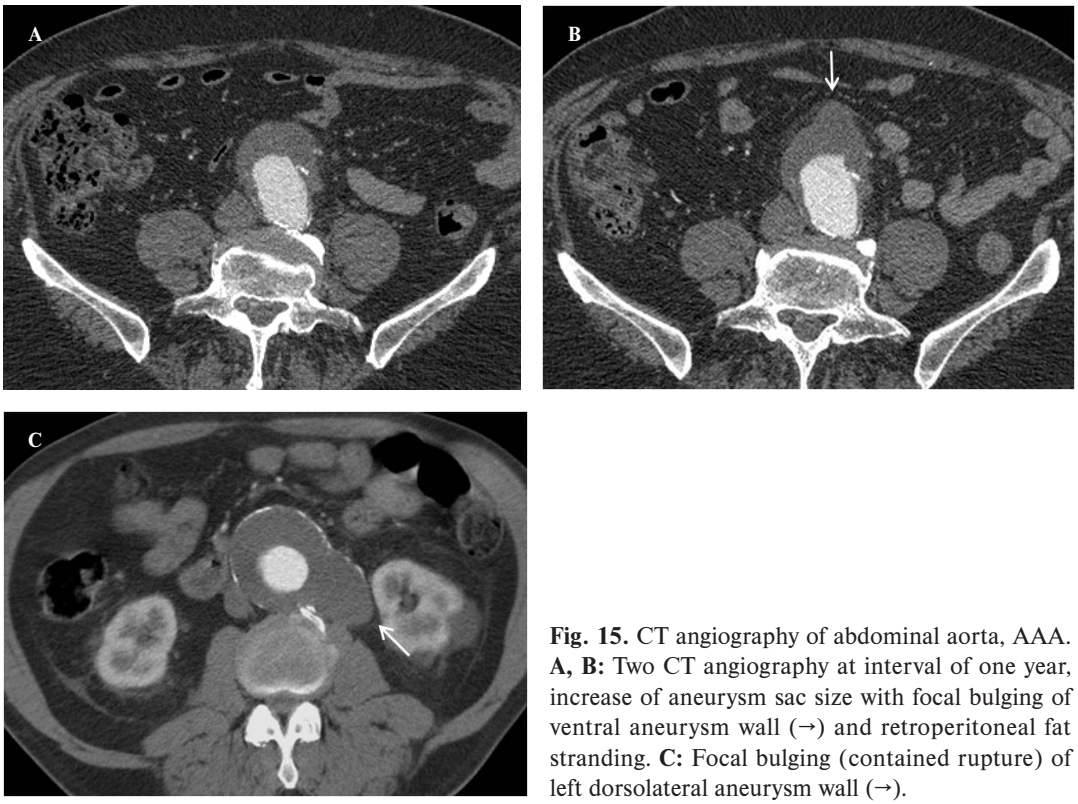


Fig. 15. CT angiography of abdominal aorta, AAA. **A, B:** Two CT angiography at interval of one year, increase of aneurysm sac size with focal bulging of ventral aneurysm wall (→) and retroperitoneal fat stranding. **C:** Focal bulging (contained rupture) of left dorsolateral aneurysm wall (→).

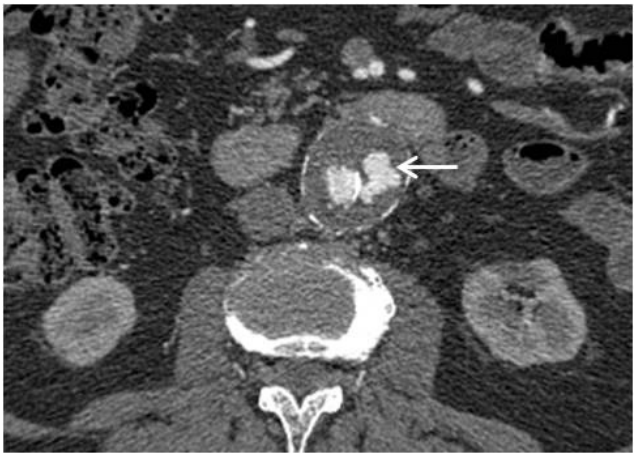


Fig. 16. CT angiography of abdominal aorta, AAA, prominent patent lumen into the thrombus (→).

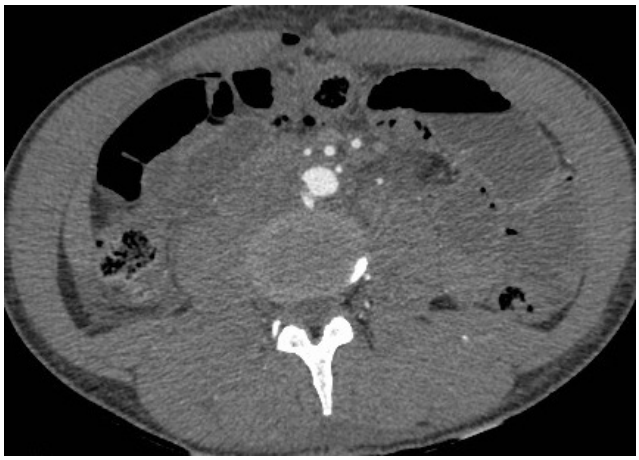


Fig 17. CT angiography of abdominal aorta. Traumatic intimal tear.

Fig. 18. CT angiography of thoracic aorta. Traumatic intimal tear of aortic isthmus (→).

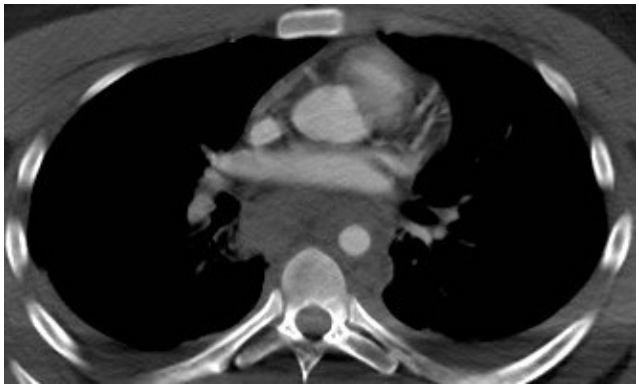


Fig. 19. CT angiography of thoracic aorta. Traumatic IMH of descending aorta (circular wall thickening). Mediastinal hematoma.

Fig. 20. CT angiography of thoracic aorta, traumatic pseudoaneurysm of aortic isthmus (→).

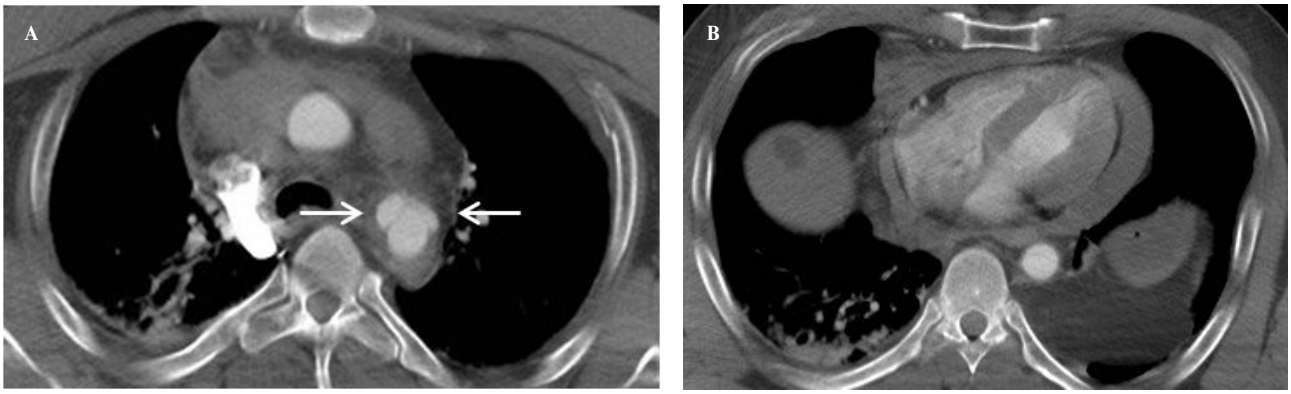


Fig. 21. CT of polytraumatic patient. **A:** Pseudoaneurysm of aortic isthmus (→), mediastinal hematoma. **B:** Hemopericardium.

Case reports

Case report No. 1 – acute aortic dissection type A (Fig. 22)

A 47-year-old male was brought by ambulance to the emergency for general weakness. The previous day he had drunk some wine and on the following morning on the way to the toilet he became generally weak and he was not able to get up. On admission to the emergency the patient was weak, sweaty, repeatedly vomiting with visual disturbances on left eye and had hypotension and aphasia. He was admitted to the hospital with a suspected transient ischemic attack. CT of the brain was performed without revealing any pathological findings. CT of the chest demonstrated aortic dissection Stanford type A. Patient was transferred to our university hospital to the department of cardiac surgery. Dissection was managed by surgery. Bentall operation (composite graft replacement of the aortic valve, aortic root and ascending aorta, with re-implantation of the coronary arteries into the graft) was performed. After surgery the patient had clinical and laboratory (increased level of serum lactate) signs of bowel ischemia. CT angiography was indicated. CT angiography showed dynamic occlusion of superior mesenteric artery by false lumen. Dynamic occlusion was managed by stent implantation.

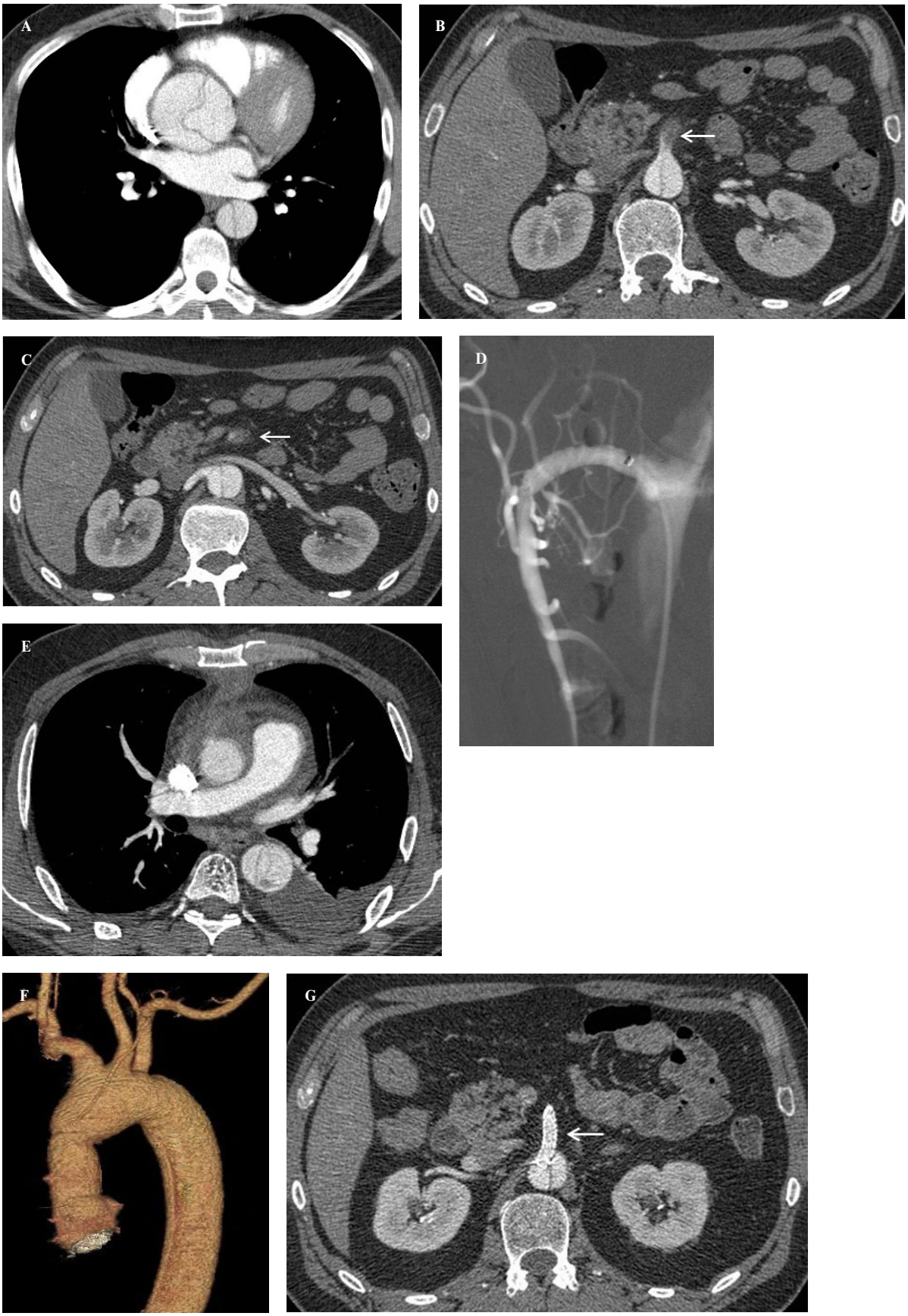


Fig. 22. A: CT angiography, acute aortic dissection type A. **B, C:** CT angiography, dynamic occlusion of superior mesenteric artery by false lumen (→). **D**: DSA after stent implantation for dynamic occlusion of superior mesenteric artery, stent with correct position, patent. **E**: Follow-up CT angiography after Bentall surgery. **F:** 3D VRT reconstruction. **G:** CT angiography, patent superior mesenteric artery with stent (→).

Case report No. 2 – uncomplicated acute aortic dissection type B (Fig. 23)
A 48-year-old man was admitted to hospital with severe pain between the shoulder blades. Suspected myocardial infarction has not been confirmed. CT angiography was performed and detected a type B dissection of the aorta. Dissection was uncomplicated; therefore only conservative therapy was indicated (correction of hypertension and analgesia).

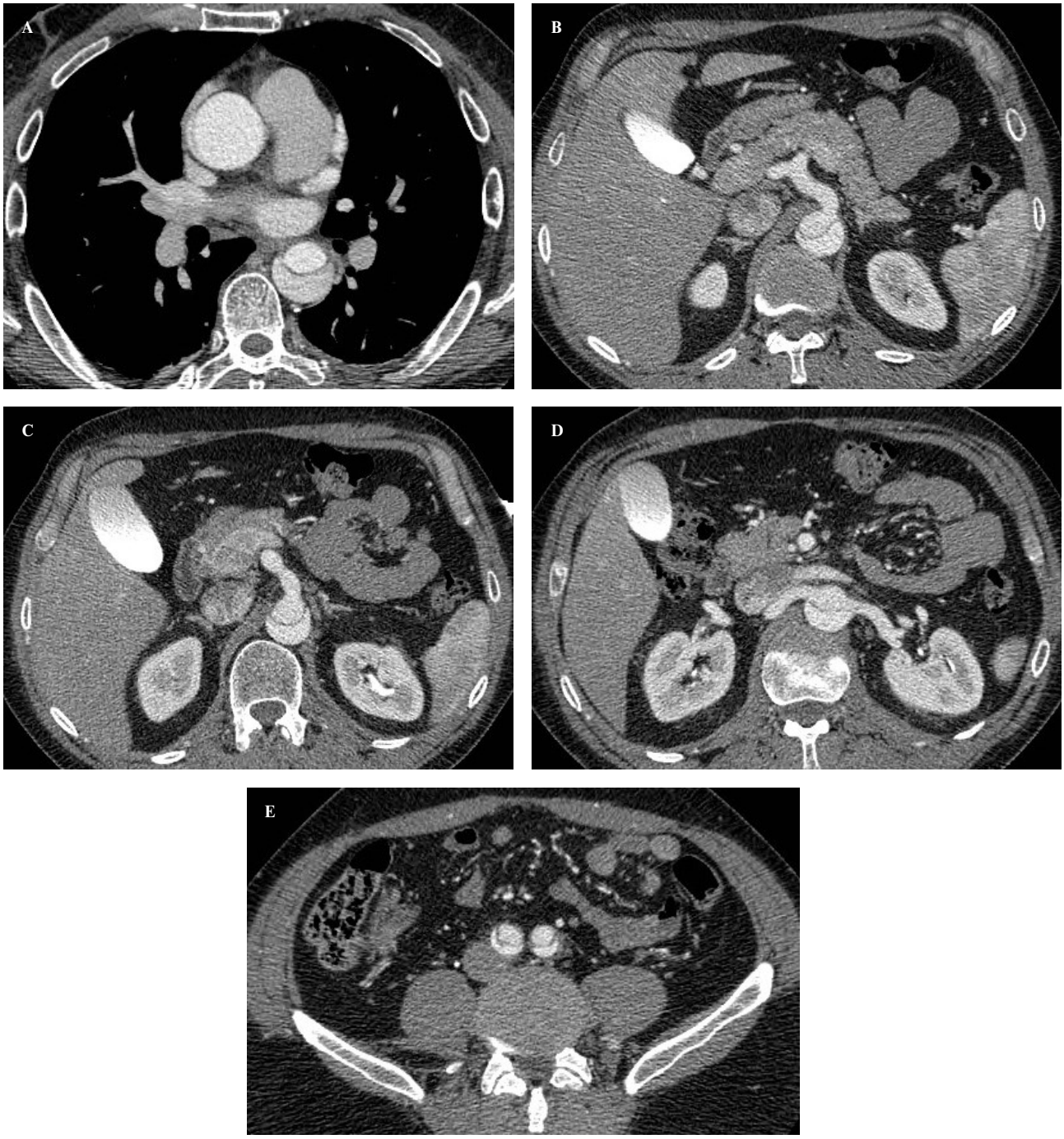
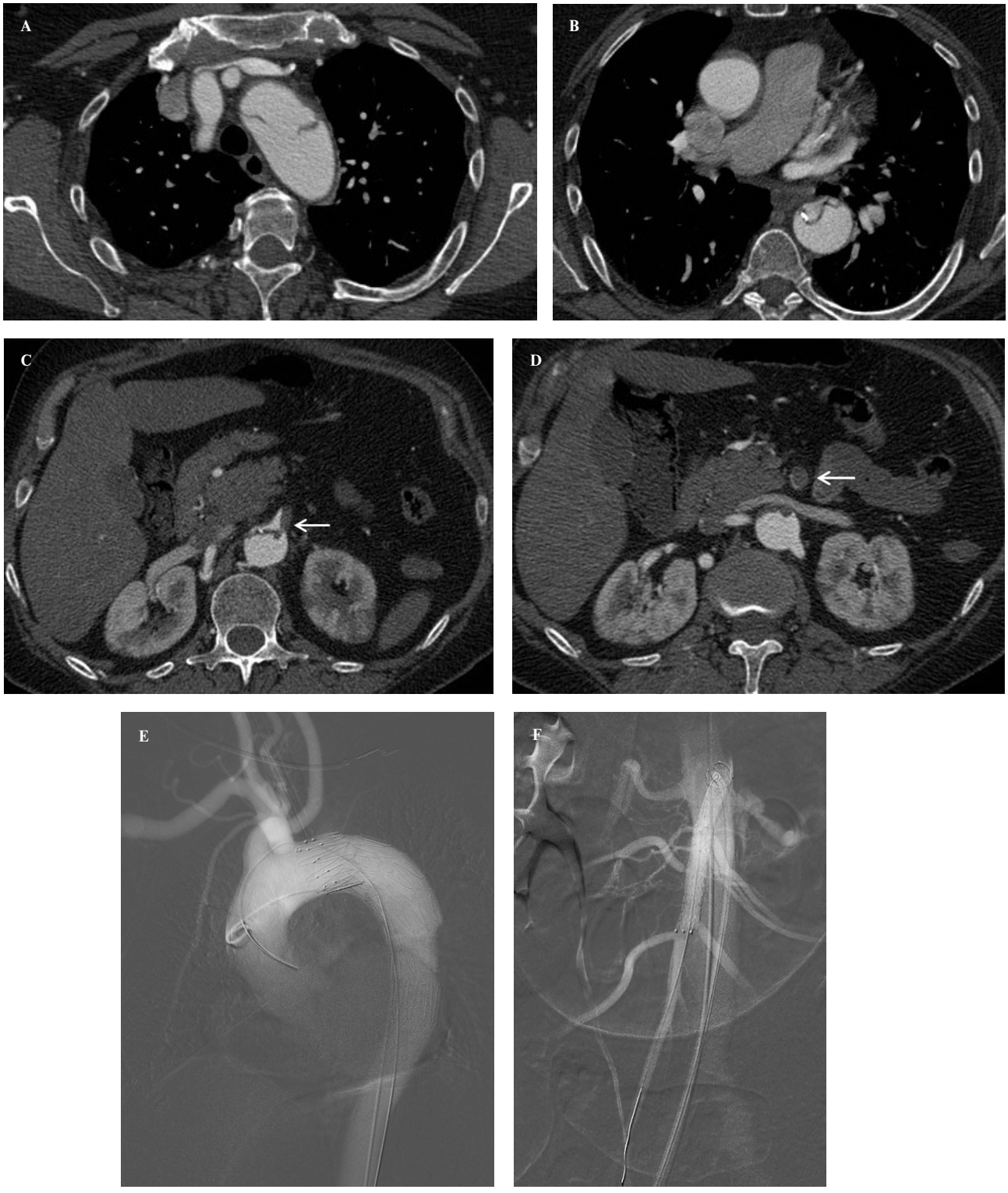


Fig. 23. A-E: CT angiography, acute aortic dissection type B. Celiac trunk, superior mesenteric artery and renal arteries are supplied from true lumen. Dissection passes to both common iliac arteries.

Case report No. 3 – complicated acute aortic dissection type B (Fig. 24)

A 60-year-old woman was brought by ambulance to the emergency for repeated vomiting, abdominal pain, sweating, hypertension crisis (220/140 mm Hg). Blood tests were performed; elevation of D-dimer was detected. Due to suspicion of aortic dissection CT angiography of aorta was performed. CT angiography confirmed acute dissection B with static occlusion of superior mesenteric artery. Emergency endovascular treatment was indicated and the patient was transferred to hybrid operating room. Stentgraft implantation with complete cover of entry of dissection and recanalisation of superior mesenteric artery was performed. A second look was performed to evaluate the vitality of intestinal loops on second day after the endovascular treatment. Intestinal loops were without pathology.



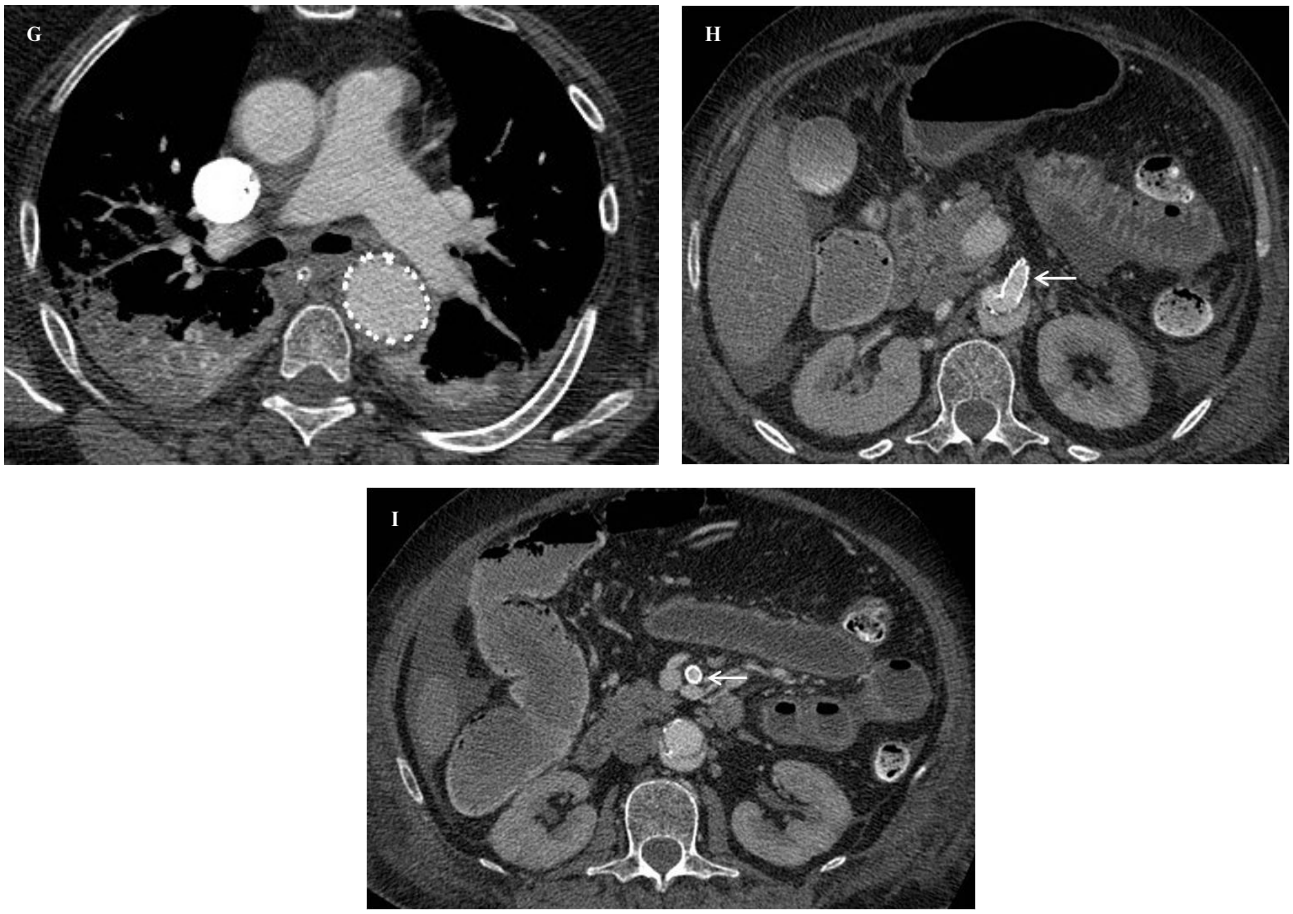


Fig. 24. A, B: CT angiography. Acute aortic dissection type B. **C, D:** CT angiography, static occlusion of superior mesenteric artery (→). **E:** DSA after stentgraft implantation to cover entry of dissection. **F:** Selective angiography of superior mesenteric artery after stent implantation, artery with stentgraft is patent. **G-I:** Follow-up CT angiography. Stentgraft is in good position. Superior mesenteric artery with stent is patent (→).

Case report No. 4 – acute intramural hematoma type A (Fig. 25)
A 38-year-old patient was brought to the emergency for unconsciousness while riding a bicycle. He had emergency hypertensive crisis. Due to suspected aortic dissection CT angiography was performed and intramural hematoma of the ascending aorta was diagnosed with haemorrhagic pericardial effusion. Patient´s status was initially treated conservatively due to the presence of coagulopathy, thrombocytopenia, hepatic dysfunction and acute renal impairment. After improvement in clinical status and laboratory findings patient was admitted to the department of cardiac surgery. Supracoronary ascending aorta replacement was performed.

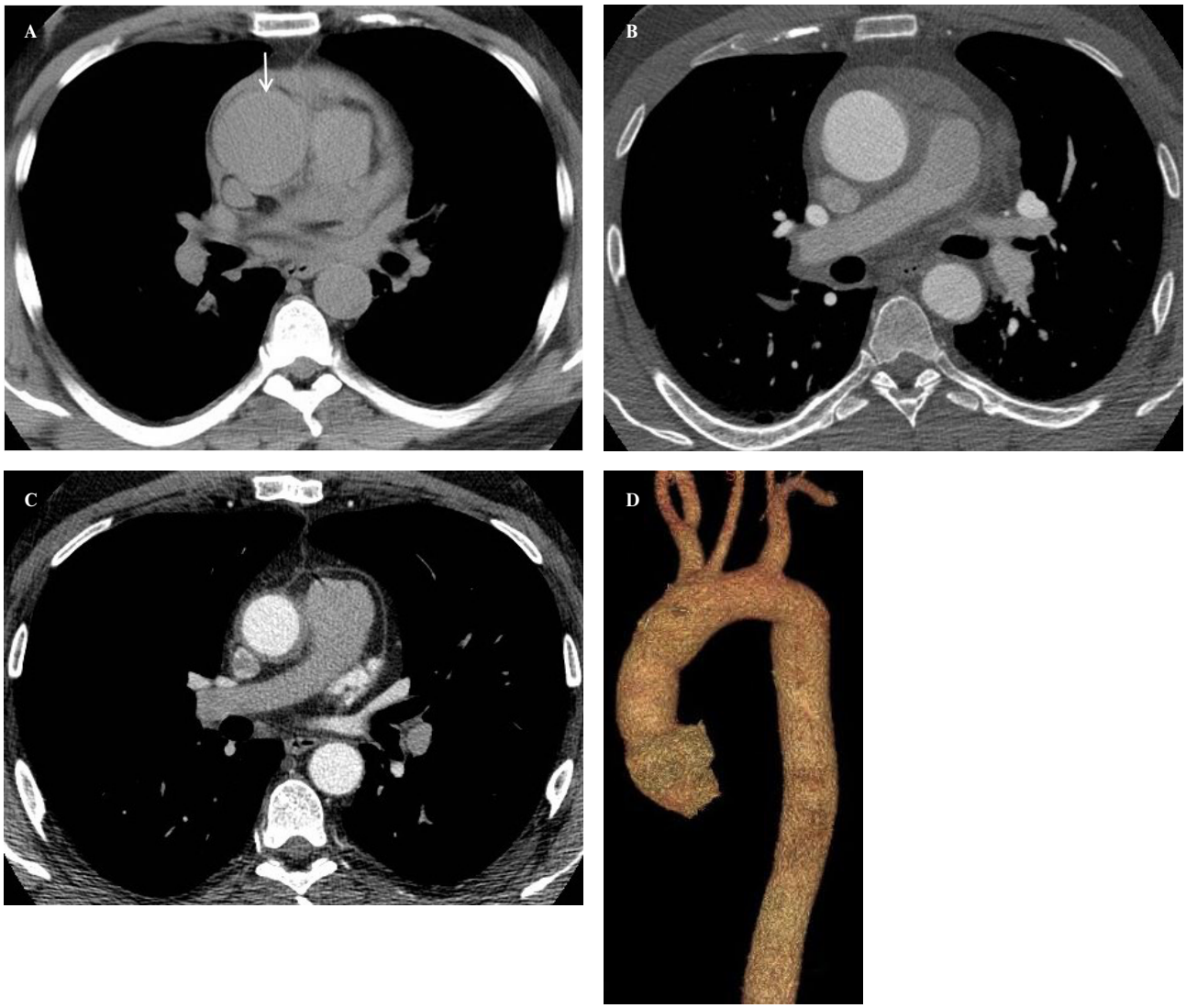


Fig. 25. A: Unenhanced CT, IMH A, hyperdense circular wall thickening of dilated ascending thoracic aorta (→), hemopericardium. **B:** CT angiography, circular wall thickening. **C:** Follow-up CT angiography after supracoronary ascending aorta replacement. **D:** 3D VRT reconstruction.

Case report No. 5 – uncomplicated acute intramural hematoma type B (Fig. 26)
A 69-year-old patient was admitted to the hospital with chest pain spreading between the shoulder blades. An acute coronary syndrome was considered because of history of ischemic heart disease with coronary angioplasty of ramus interventricularis anterior and ECG changes. Coronary angiography was performed and new stenosis of ramus circumflexus was found and conservative treatment was indicated. Due to intermittent severe chest pain CT angiography was performed. Intramural hematoma type B was diagnosed. Intramural hematoma was managed conservatively (correction of hypertension). Follow-up CT angiography showed partial reduction of the width of the intramural hematoma.

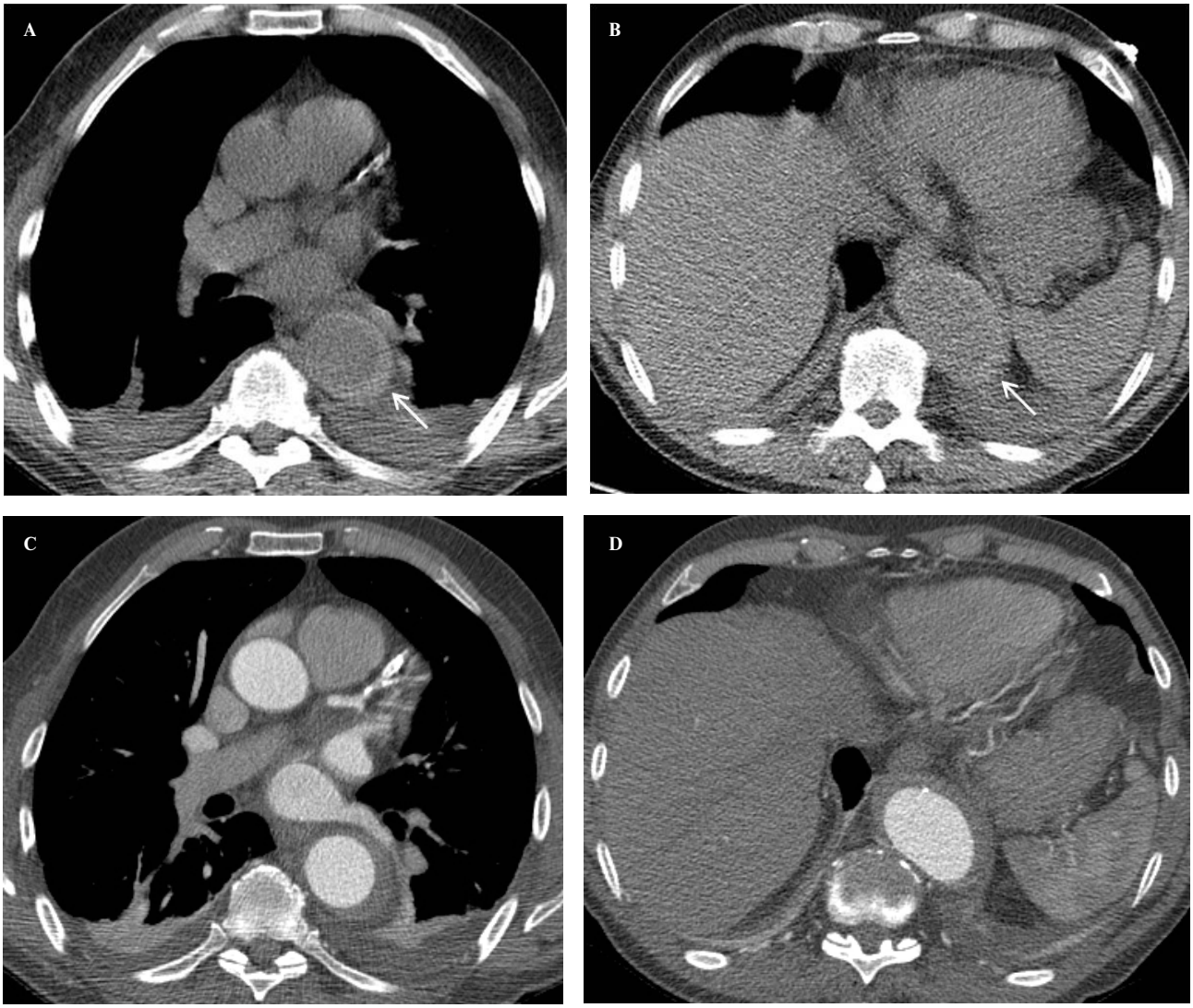


Fig. 26. A, B: Unenhanced CT, IMH type B, hyperdense circular wall thickening of descending thoracic aorta (→). **C, D:** CT angiography, circular wall thickening.

Case report No. 6 - complicated acute intramural hematoma type B (Fig. 27)
A 48-year-old man came to the emergency with epigastric pain spreading to the back, tingling sensation in his left hand, nausea and vomiting. A perforated gastric ulcer was suspected. CT of abdomen and subsequent CT angiography was performed with diagnosis of intramural aortic hematoma type B. The patient was managed conservatively (restrictions on heavy physical activities to eliminate major changes of blood pressure, correction of hypertension, follow-up). After 6 days the patient was again brought to the emergency for repeated epigastric and chest pain and vomiting. CT angiography was performed and pseudoaneurysm of thoracoabdominal aorta was found. Endovascular treatment by stentgraft implantation was performed. Five days after treatment the patients was discharged home without any pain.

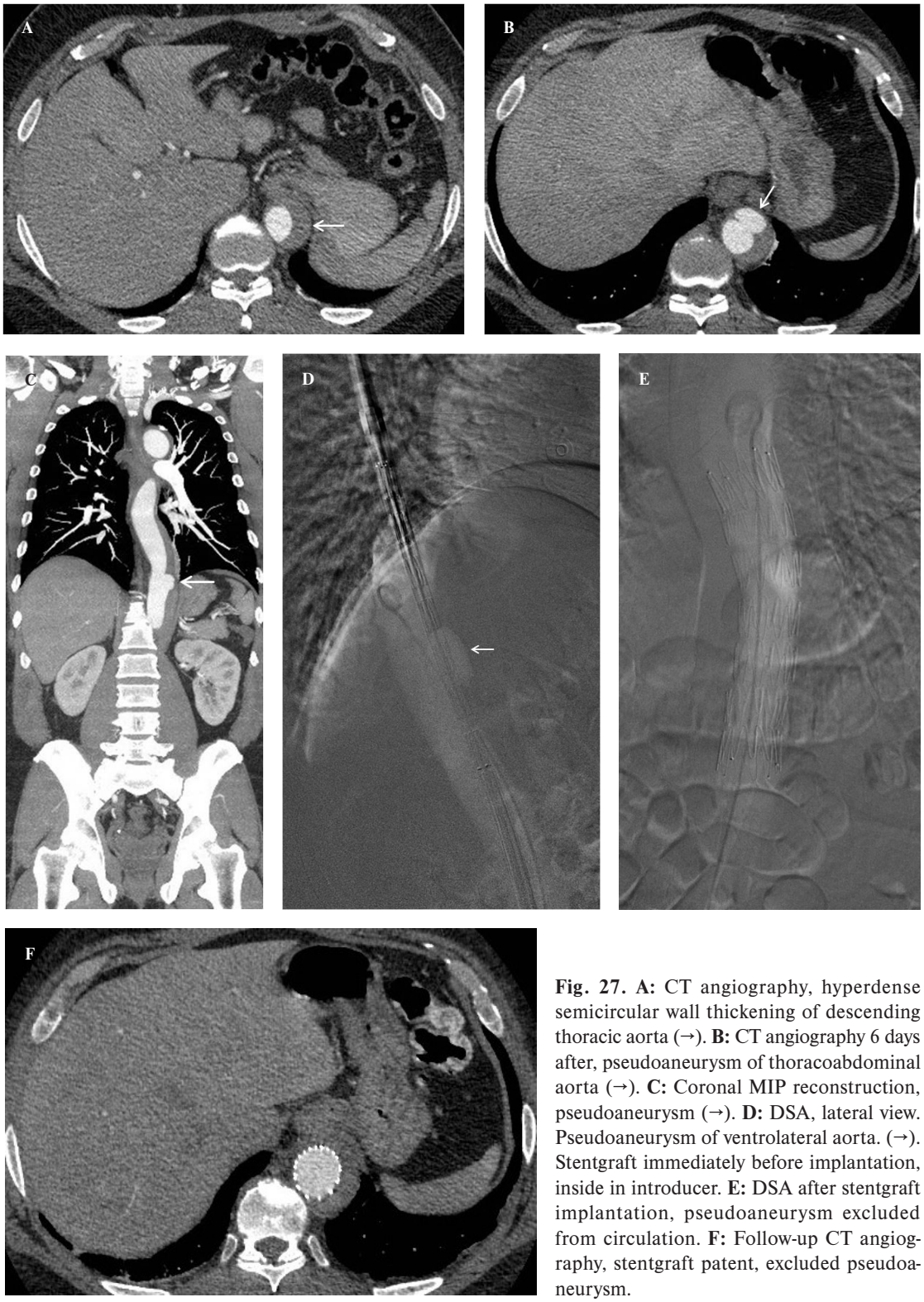


Fig. 27. A: CT angiography, hyperdense semicircular wall thickening of descending thoracic aorta (→). **B:** CT angiography 6 days after, pseudoaneurysm of thoracoabdominal aorta (→). **C:** Coronal MIP reconstruction, pseudoaneurysm (→). **D:** DSA, lateral view. Pseudoaneurysm of ventrolateral aorta. (→). Stentgraft immediately before implantation, inside in introducer. **E:** DSA after stentgraft implantation, pseudoaneurysm excluded from circulation. **F:** Follow-up CT angiography, stentgraft patent, excluded pseudoaneurysm.

Case report No. 7 – penetrating atherosclerotic aortic ulcer (Fig. 28)
A 78-year-old patient with suspected pulmonary embolism was admitted to the hospital. The patient had chest pain and dyspnoea. Pulmonary CT angiography was performed. Pulmonary embolism was not found, but pseudoaneurysm on account of atherosclerotic penetrating ulcer of aortic arch was diagnosed. The patient had multiple comorbidities and endovascular treatment would be too risky due to necessity of eventual coverage of left common carotid artery origin and creation of bypass, therefore conservative treatment was indicated.

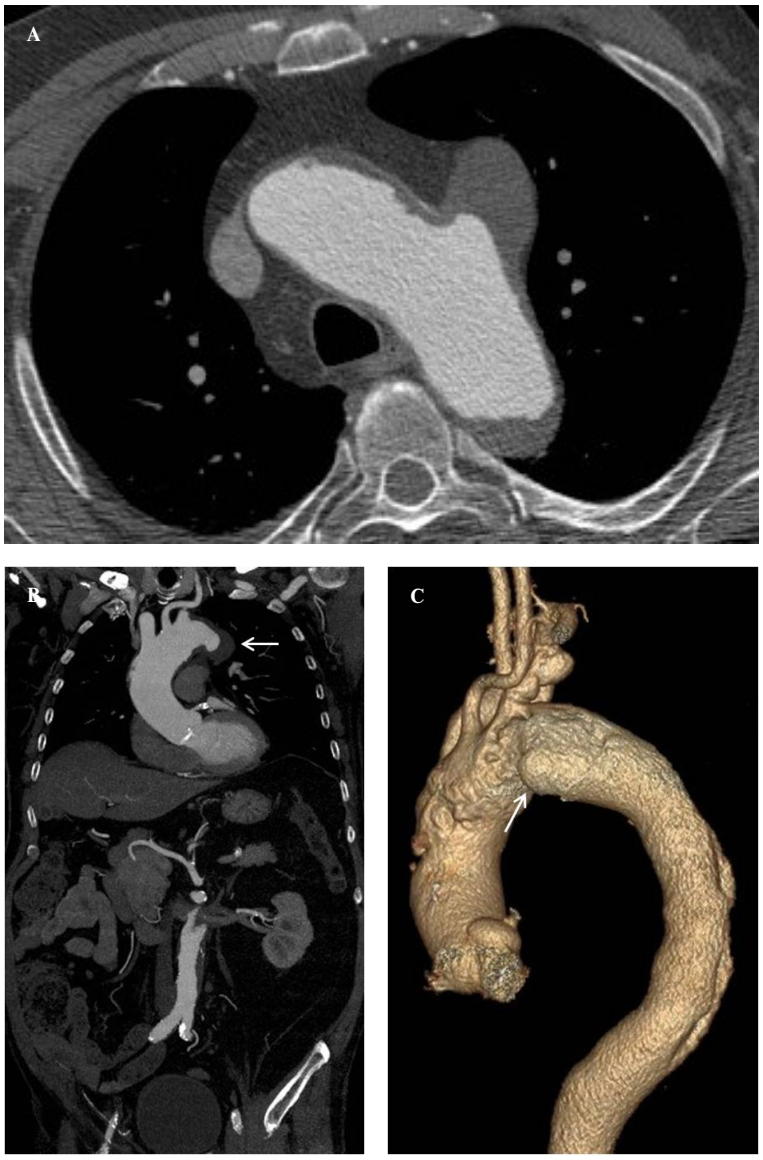


Fig. 28. A: CT angiography of aorta, pseudoaneurysm on the basis of penetrating aortic ulcer of aortic arch. **B:** MIP coronal reconstruction, pseudoaneurysm (→). **C:** 3D VRT reconstruction pseudoaneurysm (→).

Case report No.8 – ruptured AAA (Fig. 29)

A 69-year-old man was admitted to the peripheral hospital because of sudden sharp pain in his right side and under the chest associated with moist skin, nausea and vomiting. There was suspicion for a ruptured aneurysm of abdominal aorta. The performed CT angiography confirmed the diagnosis of RAAA. The patient was hemodynamically stable and he was transported to our hospital by helicopter. The patient had many other comorbidities so that an acute endovascular treatment was considered. Morphology of aneurysm was suitable for endovascular treatment and a bifurcated stentgraft was implanted. Follow-up CT angiography one year after endovascular treatment showed reduction of aneurysm sac diameter and its exclusion from blood circulation.

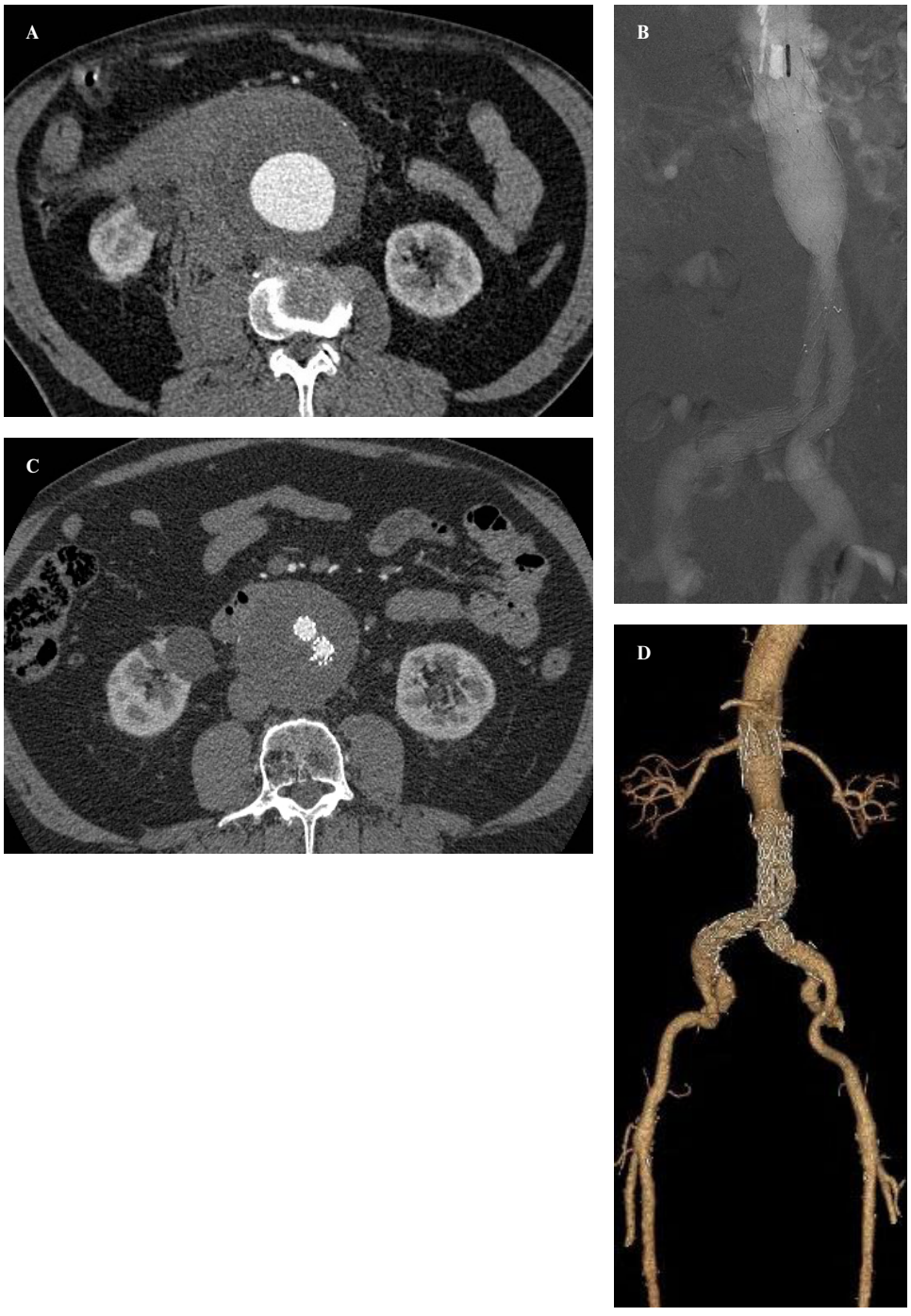


Fig. 29. A: CT angiography, ruptured AAA, retroperitoneal hematoma. **B:** DSA after urgent stentgraft implantation, stentgraft in good position, aneurysm excluded from blood circulation. **C:** Follow-up CT angiography one year after procedure. Aneurysm is excluded from blood circulation. **D:** 3D reconstruction of abdominal aorta with stentgraft.

Case report No.9 – traumatic pseudoaneurysm of thoracic aorta (Fig. 30)
A 31-year-old man was knocked down by a van. He was drunk. The ambulance was called to the accident place. The patient was hypotensive, breathing spontaneously and was with clear evidence of fractures of both shanks. The patient was transferred to the emergency where it was necessary to intubate him for hemodynamical stabilisation. CT examination (polytrauma protocol) was performed after stabilisation the patient. CT found traumatic pseudoaneurysm of aortic isthmus, multiple fractures of limbs and mandible fracture. Acute endovascular treatment with stentgraft was performed on hybrid operating room. Follow-up CT angiography showed exclusion of pseudoaneurysm by stentgraft from blood circulation.

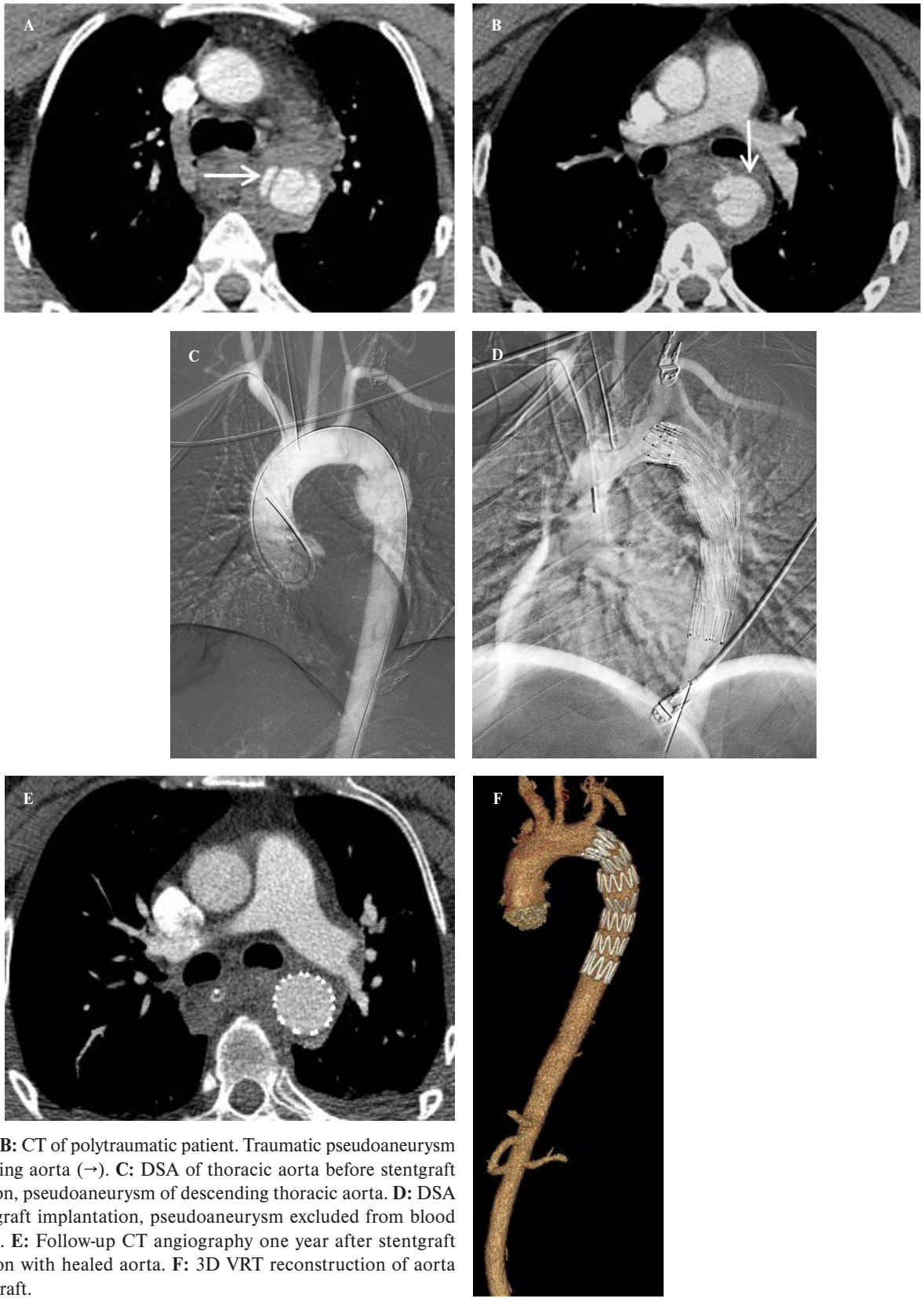


Fig. 30. A, B: CT of polytraumatic patient. Traumatic pseudoaneurysm of descending aorta (→). **C:** DSA of thoracic aorta before stentgraft implantation, pseudoaneurysm of descending thoracic aorta. **D:** DSA after stentgraft implantation, pseudoaneurysm excluded from blood circulation. **E:** Follow-up CT angiography one year after stentgraft implantation with healed aorta. **F:** 3D VRT reconstruction of aorta with stentgraft.