A clinical re-evaluation of intravenous aortography for aortic aneurysms

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Summary

The value of intravenous aortography in the pre-operative assessment of patients with abdominal aortic aneurysms is discussed.

Fifteen patients with abdominal aortic aneurysms were investigated by ultrasonography followed by intravenous aortography, and the diagnostic accuracy of pre-operative clinical assessment was compared with these investigations. Particular attention was paid to the relationship of the renal arteries to the level of origin of the aneurysm, as this determines the operative approach.

In 6 patients the operative approach was altered when intravenous aortography indicated erroneous clinical or ultrasonic diagnoses.

We have found this a safe and useful part of the routine pre-operative investigation of patients with aortic aneurysms.

Advances in techniques have enabled the surgical treatment of most aortic aneurysms. It is therefore important that the extent and degree of visceral involvement of the aneurysm be known before surgery is undertaken.

Current methods of assessment of the extent and size of aortic aneurysms are ultrasonic imaging, computed tomography (CT) and arteriography. Some authors feel that ultrasonography provides adequate information. The major advantage is that the investigation is totally non-invasive and hence free of morbidity. In addition, this technique is useful for evaluation of para-aortic masses which masquerade as an aneurysm and, when necessary, for serial measurements of aneurysm size. The major disadvantage is failure to clearly delineate visceral arterial involvement of the aneurysm. In the presence of a gas-filled bowel or ileus or a leaking aneurysm the results are unreliable. In addition, imaging is unsatisfactory in the thorax.

CT is considered superior to ultrasonography in detailing the extent and size of an aneurysm. However, apart from the fact that visceral vascular anatomy is not clearly outlined, this facility is not available in many centres.

Arteriography is certainly the most accurate technique for defining the extent and degree of visceral and iliofemoral arterial involvement. Many authors advocate the routine use of the transfemoral or transaxillary route for retrograde arteriography. Reported hazards of this procedure are aneurysm rupture during pressure injection of contrast medium, dislodgement of a thrombus or atheroma with distal embolization, or dissection of the aorta. Translumbar aortography is used in some centres but has been complicated by retroperitoneal haemorrhage, aneurysm dissection, pancreatitis and aortic thrombosis.

The technique of aortic imaging after the intravenous injection of contrast medium was first described by Greenspan et al. in 1960. Recently Morris et al. have reported their experience with this technique for delineation of aortic aneurysms.

At the Vascular Service of King Edward VIII and Addington Hospitals, Durban, we have recently used intravenous aortography in addition to ultrasonography in the pre-operative assessment of patients with abdominal aortic aneurysms. On several occasions the additional information gained has modified our management and has prompted the following report.

Patients and methods

Fifteen patients with abdominal aortic aneurysms were investigated by ultrasonography followed by intravenous aortography. The accuracy of pre-operative clinical assessment, real-time ultrasonography and intravenous arteriography has been compared. Particular attention was paid to the relationship of the renal arteries to the level of origin of the aneurysm, as this determines the operative approach.

Techniques

Ultrasonography. This was performed on a Kretz grey-scale scanner using the standard technique.

Intravenous aortography. The patients were positioned supine on a table with a centre on mid-abdomen over an AOT film charger. Bilateral rapid hand injections of sodium iohthalamate (Conray 420) 50 ml were made simultaneously into the antecubital veins. A total of 100 ml of contrast medium was therefore injected. Radiographs were exposed at the rate of 1 per second for 10 seconds commencing 10 seconds after completion of the injections. An abdominal film was taken 10 minutes after completion of the injections to demonstrate renal function. Subtraction prints made from the original films may give better visualization of the aorta if required. Fig. 1 clearly demonstrates an infrarenal aneurysm using this technique.

All patients were interrogated as regards iodine contrast medium sensitivity before investigation.

Results

The relative accuracy of clinical examination, ultrasonography and intravenous aortography in assessing the level of origin of an aneurysm is shown in Table I.

Intravenous aortography was incorrect in only 1 patient. Ultrasonography yielded an identical proportion of incorrect results when compared with the findings on abdominal examination.
Details of findings on clinical examination, ultrasonography, intravenous aortography and at operation are summarized in Table II. In at least 6 patients, 2 of whom are described, the aortogram modified the operative approach.

Patient 6 was an obese male who presented with a painful pulsatile abdominal mass. Tenderness precluded accurate delineation of the suspected aneurysm. Ultrasonography suggested a suprarenal aneurysm but air-filled dilated bowel loops made accurate diagnosis difficult. Intravenous aortography confirmed the presence of a large thoraco-abdominal aneurysm (Fig. 2). An emergent transpleural retroperitoneal thoraco-abdominal approach was therefore chosen in preference to a transperitoneal approach.

In patient 11 clinical assessment was difficult because of obesity and abdominal tenderness. Ultrasonography showed what was suspected to be a thoraco-abdominal aneurysm. Intravenous aortography (Fig. 3) revealed that the aneurysm arose below the renal arteries. This was confirmed at operation. A large saccular component to the aneurysm was found to overlie the suprarenal aorta. No complications related to contrast medium injection were encountered in any patients in this series.

### Discussion

In order to plan surgery for abdominal aneurysm adequately it is important to obtain as much information as possible, particularly with regard to the relationship of the level of origin of the aneurysm to the visceral arteries.

Ultrasonography is of undoubted value in monitoring aneurysm size in patients treated conservatively, or for diagnostic purposes, but is not specific enough for confident surgical planning. In the present group of patients we have found

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<th>Patient</th>
<th>Clinical assessment</th>
<th>Ultrasound assessment</th>
<th>Intravenous aortography</th>
<th>Operative findings</th>
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the technique of intravenous aortography to be an expeditious, safe and accurate method of delineating the level of origin of the aneurysm, the extent of visceral vessel involvement and, in most cases, the degree of iliac vessel involvement. In at least 6 patients the operative approach was altered when intravenous aortography corrected erroneous clinical or ultrasonic diagnoses.

In the emergency situation aortograms were invaluable in 3 patients in whom abdominal tenderness and obesity made clinical assessment difficult and the presence of extensive haematoma and paralytic ileus made interpretation of ultrasound imaging difficult. Additional important information that may be obtained with this technique relates to the anatomy of the urinary tract, particularly with regard to the presence of horseshoe kidney, ureteric anomalies or accessory renal arteries.

We have also found aortic imaging by intravenous contrast medium administration useful in determining renal artery patency following reconstruction associated with aneurysm surgery.

While retrograde Seldinger arteriography may provide more detailed information in some patients, our current protocol in the pre-operative investigation of patients with abdominal aortic aneurysms is to follow ultrasonography with intravenous aortography. Retrograde arteriography is reserved for patients in whom information thus acquired proves inadequate.

REFERENCES