Service: Vascular

Treatment of type B aortic dissection (TBAD)

Intra-mural haematoma (IMH)

Penetrating aortic ulcer (PAU)
What is a thoracic aortic aneurysm?

The aorta is the largest blood vessel in the body. It carries blood from the heart through the chest and the abdomen (tummy). At about the level of the belly button, the aorta divides into two arteries carrying blood to each leg.

An aortic dissection develops when the wall of the aorta becomes less elastic and tears. This weakens the wall, making it more likely that the wall swells, leading to an abdominal aortic aneurysm (AAA), which can even burst (rupture).

Intra-mural haematoma and penetrating aortic ulcer are variants of aortic dissection. Together, these three conditions are called acute aortic syndrome.

Dissection most commonly occurs into the part of the aorta that leaves the heart (ascending aorta). This is known as a Type A dissection and requires immediate lifesaving open aortic surgery.

Dissection into the aorta as it passes down through the chest (descending aorta) is known as a Type B aortic dissection (TBAD). TBAD has, in the past, been managed with surgery only for a life or limb threatening complication. Surgery with a thoracic aortic stent is now also offered to prevent late aortic expansion.

If you develop severe chest or back pain, then you should call 999 to be taken to your nearest Emergency Department for assessment.
What should I be concerned about?

The immediate concerns are that the aorta will burst (rupture), or that blood supply to vital organs is interrupted (malperfusion).

Rupture can happen because the wall of a dissected aorta is weaker than that of a normal healthy artery. If a dissected aorta bursts, then internal bleeding occurs. This is a sudden event, with little or no warning, and one that most people do not survive.

Malperfusion can happen because the area of the aorta through which blood can flow is reduced by the dissection flap.

Why has my aorta dissected?

If you are aged less than 40 years old, then you most likely have a weakness of the middle layer of your aortic wall. This can be inherited from your parents, or it may be the result of a change in your genes (which we call a ‘new gene mutation’).

Approximately half of people under 40 years old investigated for TBAD will be found to have Marfan’s syndrome or another connective tissue disease.

If you are older than 60 years, then the likely cause is stiffening of the middle layer of the aorta with aging, a process made worse with high blood pressure or if you smoke.

If you are aged 40-60 then there are likely to be a combination of factors.

Aortic dissection is also more common in aortas that have already enlarged. Acute aortic syndrome can also be associated with vasculitis or trauma (i.e. a high-speed road traffic accident or a recent medical procedure).
How does having an aortic dissection affect my life?

We advise maintaining a low blood pressure and no heavy lifting or high-intensity exercise, otherwise you should continue to live and work as normal. If you do have a heavy manual job, please discuss with your consultant any concerns you might have.

You can still drive, unless you are given instruction not to (e.g. if your aneurysm is very large, bigger than 6.5cm in diameter) or you are an HGV driver. Patients don’t need to inform DVLA of aortic dissection unless they have a bus, coach or lorry licence: www.gov.uk/aneurysm-and-driving

What is the risk of aortic rupture?

The risk of aortic rupture is highest in the first 48 hours following the acute dissection event. Ongoing pain after that time is a concern.

In the long term, the risk of aortic rupture increases with size. It is usually above a diameter of 6.0cm that the benefits and risks of intervention as a planned procedure are considered. A lower threshold is used for patients with connective tissue disease (i.e. Marfan’s syndrome). There is up to 1 in 3 risk of rupture each year once the aorta is larger than 6.0 cm.

The risk of AAA rupture is greater in:

- Women
- People with connective tissue disease (i.e. Marfan’s)
- People who smoke
- People with family history of thoracic aneurysm or dissection
- People with uncontrolled high blood pressure
Should everyone with TBAD have surgery?

The short answer is no, as each person’s risks from their dissection and risk of complications from surgery is different. The decision of whether to choose to undergo surgery is a balance of factors important and relevant to you. Surgery can carry the risk of death and other complications, but the risk of no surgery is a rupture, malperfusion, extension, or expansion.

Surgery is usually considered for rupture or malperfusion or late aortic expansion to greater than 6cm in diameter (or smaller in patient with Marfan’s). Surgery can also be considered before this, in the ‘subacute’ phase (see below). Some people choose early intervention to prevent late problems.

The highest risk periods for a TBAD are therefore the acute phase in all people and the chronic phase in people whose aorta expands.

<table>
<thead>
<tr>
<th>Acute phase</th>
<th>Early sub-acute phase</th>
<th>Late sub-acute phase</th>
<th>Chronic phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 48 hours</td>
<td>48 hours to 6 weeks</td>
<td>6 weeks to 12 weeks</td>
<td>Any time after 12 weeks</td>
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</tbody>
</table>

Will I need special tests?

The type of surgery, and the risks associated with that surgery, depends largely on the shape of your aorta. Your dissection is evaluated using a CT scan.

The CT to the right shows a Type B aortic dissection with the ‘true lumen’ (normal passageway for blood) and the ‘false lumen’ (newly created passageway). This dissection can be treated by either open surgery or an aortic stent graft (TEVAR).
You will also have assessments of your fitness:

- Consultation with a doctor with a specialist interest in medicine for the elderly (complex care assessment, CCA)
- Stationary bike test (cardiopulmonary exercise test, CPET)
- Pre-operative assessment clinic appointment (POAC)

More information about preparation for surgery can be found in the leaflet, ‘Coming in for your aortic surgery’.

Screening family members

Your vascular specialist will ask you about your family history. If you have close relatives with AAA, TAA, or aortic dissection, you may wish to consider having genetic testing. Testing can help you understand whether an inherited health condition may affect you, your children or another family member. 

https://www.nhs.uk/conditions/genetic-and-genomic-testing/

Your vascular specialist may also recommend imaging of family members with ECHO or MRA to check if they have aortic disease.

A genetic cause is more likely if you have:

- **Marfan’s Syndrome** or other connective tissue disorder
- **Bicuspid valve** – a double flap (leaflet) in your aortic valve
- **Another inherited condition**
Your treatment options

Open surgical repair

Open surgical repair involves opening your chest (a thoracotomy) to repair the aneurysm by sewing in an artificial piece of artery (graft), shown in the image.

This is major surgery and requires your surgeon to stop the blood flowing in the aorta with clamps for a period whilst the graft is stitched into place. This may need a heart bypass.

Your vascular specialist may recommend that the risks of open surgery are too great to contemplate. This recommendation will depend on factors including your age, health and the shape of your aneurysm. If you have an aneurysm which extends up to your aortic arch or down to your abdomen, surgery will be technically more difficult. The risk of death or a major complication will as a result be higher. More detailed information on open arch and thoracic aortic surgery can be obtained from the Bristol Heart Institute.

'Frozen elephant trunk' (‘Thoraflex’ or ‘FET’) for treating aneurysm involving the aortic arch.

Open thoraco-abdominal aortic aneurysm repair (thoracic and abdominal).
Aortic stent graft (TEVAR)

A stent graft consists of synthetic fabric tubes (the ‘graft’) mounted onto metal skeletons (the ‘stents’).

The stent graft comes loaded into a delivery system. The delivery system, of similar width to a pen, is small enough to be inserted through an artery in your groin. The stent graft is positioned using x-rays and deployed using the delivery system, which is then removed and the small incisions in the groin closed.

The aim of the stent graft is to allow blood to only flow through the stent graft tubes into the dissection ‘true lumen’. This reduces pressure on the ‘false lumen’ and should shrink it.

If you have access to the internet you can watch video animations of how the thoracic stent grafts work at the website below:


Please read our ‘Thoracic aortic stent graft’ leaflet for more information.
Complex aortic stent graft (complex EVAR)

In some people, the shape of their AAA is such there is insufficient healthy aorta below the arteries to the kidneys, or in one or both common iliac arteries, for a standard stent graft to fix in place. To treat these aneurysms, it is often possible to use a ‘complex’ stent graft, often *custom made* to fit an individual patient.

Instead of being a ‘tube’, custom stent grafts are made with holes (fenestrations) or branches, in the positions that arteries come off the aorta and/or for the internal iliac arteries. These maintain blood supply to vital organs, or the pelvis, whilst excluding the aneurysm sac from blood flow.

The stent graft is completed with components as for a standard endovascular repair. This means that these ‘complex’ stent grafts can be safely extended up into the thoracic aorta or down into the external iliac arteries.

*Complex aortic stent grafts carry higher risks than standard EVAR.* There is also a higher risk of needing further procedures. However, complex stent grafts are significantly safer than open surgery when a clamp must be placed above the arteries to the liver and gut for aneurysms that extend up into the chest.

Please read our ‘Complex Aortic Stent Grafts’ leaflet for more information.
Medical management

After surgery, patients must have medical management to control blood pressure to prevent late aortic events. However, sometimes the medical team recommends, and patients may choose, to only have medical management. This is aimed at stabilising the dissection and preventing future aortic events.

Advantages of ‘medical management alone’

- No risk of death or complications from an operation.
- No impact on quality of life.
- Most of the danger from a Type B aortic dissection comes in the first 10-30 days. After this period, the risk of intervention may be higher than the risk of late rupture.
- On average, 7 out of 8 patients derive no benefit from an aortic stent graft to prevent late aortic degeneration.

Disadvantages of ‘medical management alone’

- On average, 1 out of 8 patients has late aortic degeneration prevented by an aortic stent graft in the sub-acute phase.
- Greater anxiety regarding the risk that aorta might dilate.

Size thresholds

In acute aortic dissection (less than 3 months), it is usual to set a threshold aortic size of greater than 4cm for consideration of surgery.

For chronic aortic dissection (more than 3 months), it is usual to set a threshold of 6cm for repair (or lower in patients with Marfan’s).
More information

British Heart Foundation
https://www.bhf.org.uk/informationsupport/conditions/aortic-aneurysm

NHS Choices
https://www.nhs.uk/conditions/marfan-syndrome/

Healthy living
Adopting a healthier lifestyle and diet means that if have AAA surgery you will be in in the best possible health, both for the surgery itself and for recovery after. You can do this by stopping smoking, losing weight, reducing alcohol intake, exercising more regularly, controlling high blood pressure, and taking statin medication.

Post-operation imaging
All patients who have suffered an aortic dissection are advised to have life-long follow-up imaging, usually every 12 months. This is with a combination of CT or MR.

What might we be looking out for?
An ‘endoleak’ means that blood is ‘leaking out’, flowing into and out of the aorta outside of the stent graft. Some bloodflow into the false lumen is to be expected in certain treatments but when the treatment is a stent graft, where the false lumen is ‘excluded’, there should not be a leak. This might mean the aneurysm is starting to grow again. In this case, a further intervention would be needed to ‘reseal’ it.

Alternatively, the aneurysm could expand again. Both people who choose to have had an aortic stent graft and people who choose medical treatment are at risk of late aortic expansion and rupture. The risk of this happening is reduced by regular imaging.
How do I decide which option is best for me?

Consider the benefits and risks of each option

<table>
<thead>
<tr>
<th></th>
<th>Benefits</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open surgery</strong></td>
<td>- Lower risk of further procedures</td>
<td>- Usually only undertaken in ‘chronic’ setting</td>
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<tr>
<td></td>
<td>- Very low risk of rupture</td>
<td>- Higher risk of early death, complications and disability</td>
</tr>
<tr>
<td></td>
<td>- Preferred in Marfan’s syndrome</td>
<td>- Longer hospital stay</td>
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<tr>
<td></td>
<td></td>
<td>- Slower recovery</td>
</tr>
<tr>
<td><strong>TEVAR</strong></td>
<td>- Lower risk of early death and complications</td>
<td>- Risk of retrograde dissection, stroke and paraplegia</td>
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<tr>
<td></td>
<td>- Shorter hospital stay</td>
<td>- Higher chance of needing further procedures</td>
</tr>
<tr>
<td></td>
<td>- Faster recovery</td>
<td></td>
</tr>
<tr>
<td><strong>Complex EVAR</strong></td>
<td>- Intermediate risk of death and complications</td>
<td>- Delay for manufacture</td>
</tr>
<tr>
<td></td>
<td>- Intermediate hospital stay</td>
<td>- Usually only undertaken in ‘chronic’ setting</td>
</tr>
<tr>
<td></td>
<td>- Faster recovery</td>
<td>- Higher chance of needing further procedures</td>
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<tr>
<td></td>
<td></td>
<td>- Aorta could still rupture (&lt;1% chance per year)</td>
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<tr>
<td></td>
<td></td>
<td>- Risk of groin problems</td>
</tr>
<tr>
<td><strong>Medical management</strong></td>
<td>- Defers risk of complications from surgery</td>
<td>- Risk of aortic rupture increases up to 1 in 3 per annum for a dissection bigger than 6.5cm</td>
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</tbody>
</table>

Ask questions

There are inevitably pros and cons to each choice. It is a good idea to think about what is most important to YOU. Ask your vascular specialist and team questions too, like ‘What are my treatment options?’ , ‘What help do I need to decide?’ and ‘What are the benefits and risks of each option?’ You can also phone the team (contact details on the back page).
Consider the risks and benefits for YOU

There is no one-size-fits-all answer to which treatment option is best. It will depend on a number of personal factors. See the risks and benefits patients considered below:

Shared decision in favour of **medical management**

A woman, aged 78 years old, has an acute aortic dissection which can only be repaired with open surgery as it extends into her aortic arch. She gets daily chest pain (angina), has had a stroke and there is a high risk of death or complications from surgery. Her pain has resolved on blood pressure medication and she has no branch vessel (malperfusion).

<table>
<thead>
<tr>
<th>Risk of surgery</th>
<th>Risk of no surgery</th>
</tr>
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<tbody>
<tr>
<td>Higher risk of death or complications</td>
<td>Risk of rupture</td>
</tr>
<tr>
<td>Recent stroke</td>
<td>Malperfusion</td>
</tr>
<tr>
<td>Chest pains</td>
<td>Expansion</td>
</tr>
</tbody>
</table>

Shared decision in favour of **choosing surgery**

A man, aged 62 years old, has an aortic dissection that has ruptured in his mid-chest. He has a low blood pressure but is stable. His kidneys have stopped working. Without immediate intervention he is unlikely to survive.

<table>
<thead>
<tr>
<th>Risk of surgery</th>
<th>Risk of no surgery</th>
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<tbody>
<tr>
<td>Risk of death and complications from surgery</td>
<td>Risk of rupture</td>
</tr>
<tr>
<td></td>
<td>Malperfusion</td>
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<tr>
<td></td>
<td>Extension</td>
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<td></td>
<td>Expansion</td>
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</table>
If you or the individual you are caring for need support reading this leaflet please ask a member of staff for advice.

If you're an overseas visitor, you may need to pay for your treatment or you could face fraud or bribery charges, so please contact the overseas office: Tel: 0117 414 3764  Email: overseas.patients@nbt.nhs.uk

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