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# Delivery of Optimum Management of Type B Aortic Dissection in the UK: Sum of All Fears!

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## Abstract

**Introduction:** This review aims to summarise the current trend and practice for management of Type B aortic dissection (TBAD) across the UK. We also aim to highlight the service specification and configuration as well as the current portrayed outcomes published from different sources within the UK.
**Methods:** We carried out a comprehensive literature search on multiple electronic databases including PUBMED, Scopus and EMBASE in order to collate all research evidence on TBAD service line in the UK. We also navigated through official reports published from different sources within the UK specifically highlighting aortic dissection.
**Results:** The UK's research into TBAD falls short when compared to international counterparts due to a lack of evidence related to TBAD incidence and outcomes. Some TBAD patients are managed at unspecialised centres and others are lost to follow-up. The UK's vascular surgery workforce is expanding at a very slow rate and the specialised aortic units are consistently failing to meet the waiting time standards for treatment.
**Conclusions:** Restructuring and service reconfiguration are imperative for outcome reporting for TBAD affected population cohort. TBAD should be centralised towards hospital with concentrated level of experience and expertise.

*Keywords:* Type B Aortic Dissection, Aortic Dissection, Aortic Dissection, Aortic Surgery, United Kingdom

## 1. Introduction

Aortic dissection (AD) is a life-threatening condition that affects approximately 4.5 persons per 100,000 per annum admitted to any hospital in England (1). Based on the Stanford system developed by Daily and colleagues (2) at Stanford University, AD can be classified into either Type A or Type B (TAAD or TBAD). Type B aortic dissection, which will be the focus of this review, comprises 30% of all ADs and is characterised by a tear in the intimal layer of the aorta originating distally to the left subclavian artery (LSA) without direct ascending aorta or arch involvement (3).

Surprisingly, the UK research output on TBAD falls short when compared to global counterparts as the system fails to provide adequate data relating to TBAD outcomes. The National Institute for Cardiovascular Outcomes Research (NICOR) published the results of its National Adult Cardiac Surgery Audit (NASCA) in 2020 (4). The report featured a section on surgery for acute aortic dissection and highlighted the UK's performance from 2016 to 2019. Although the report did not specify whether the data reflects TAAD or TBAD, it included 1263 patients of whom 1039 (82.3%) survived emergency surgery for AD. The mean in-hospital mortality rate of 17.7% which is similar to that reported in the 2007 and 2013 NASCA reports (17.2%) as well as Canada (5) but exceeded figures from Germany and the United States (6-9). The recently released NICOR NASCA 2021 Annual Report did not include any data on aortic dissection (10).

The Hospital Episode Statistics (HES) data used in the Getting It Right First Time (GIRFT) programme (2018) included all non-elective aortic surgeries and showed a mean UK mortality rate of 12.3% for England (4). However, other studies have demonstrated an increase in the incidence of

AD in the UK, while the incidence of TBAD specifically remains unknown (11, 12). There is a distinct lack of observational evidence on TBAD specifically, unlike TAAD which is more established in the published literature. Henceforth, during our systemic literature search on the UK's TBAD service and its outcomes, we seldom identified original studies from our national centres, but found an abundance of publications originating from other countries. Therefore, the aim of this review is to summarise current state-of-the-art relating to TBAD service in the UK and propose future recommendations for service reconfiguration to improve patient management.

## 2. What Do We Know and Is It Enough?

TBAD can be acutely complicated due to complications associated with malperfusion syndrome (static or dynamic in nature), aortic rupture, refractory pain, and evidence of early rapid progression of the disease. Complicated TBAD (co-TBAD) is associated with higher mortality and morbidity than uncomplicated TBAD (un-TBAD), which presents in the absence of the above associated complications (1, 3). Both TAAD and TBAD can be further categorised based on time of onset into acute (< 15 days), subacute (15 - 90 days), and chronic (> 90) (2-5, 13, 14). The International Registry of Aortic Dissection (IRAD) classifies AD based on time into hyperacute (< 24 h), acute (2 - 7 days), subacute (8 - 30 days), and chronic (> 30 days) (3). According to international guidelines, gold-standard treatment for TAAD and co-TBAD is thoracic endovascular aortic repair (TEVAR) which has replaced open surgery, while un-TBAD is usually managed conventionally with optimal medical therapy (OMT) to control systemic blood pressure and heart rate. Recent research highlights a paradigm shift to TEVAR alongside OMT in un-TBAD. The optimal therapeutic window for TEVAR still remains to be established, although intervention during the sub-acute phase of dissection (15 - 90 days following symptoms onset) seems to yield best results (3, 15, 16).

Different NHS foundation trusts issue slightly different protocols for diagnosing and managing AD. Nevertheless, if acute AD (AAD) is suspected, it is common practice to start by performing a chest X-ray, ECG, and most importantly, computed tomography (CT) scan (contrast-enhanced) as well as transthoracic echocardiography (TTE). If the CT/TTE is inconclusive, further advanced imaging may be provided such as magnetic resonance imaging (MRI) or transoesophageal echocardiography (TOE) (17). However, if AAD is confirmed, management will be surgical if its TAAD and conservative with OMT if TBAD unless complications develop rapidly (13). NICE only provides a clinical pathway for thoracic and abdominal aortic aneurysms (14).

## 3. A Satellite View of the Problem in the UK

The National Health Service (NHS) provides treatment guidelines for both TAAD and TBAD, with intervention for TAAD led by a team including cardiac surgeons and interventional cardiologists. The care for TBAD is invariable by vascular surgeons and interventional radiologists and cardiologists. However, a grey area of shared ownership exists because the presentation of TBAD is varied, and thus, it is often missed out and sometimes misdiagnosed. Moreover, since OMT is initiated when un-TBAD is suspected some patients become lost to follow-up when sent back to the community, therefore, outcome data are also lost (11). Field et al. (11) published a review in 2011 and described how acute un-TBAD patients are often managed at unspecialised units and stressed the need for these patients to be treated at specialised aortic units. The authors also referred to NICE guidelines entitled *Endovascular stent-graft placement in thoracic aortic aneurysms and dissections* last published in 2005. Since 2005 there has been several international studies published that altered TBAD practice, including INSTEAD and INSTEAD-XL trials, ADSORB trial, STABLE and STABLE II trials and the VIRTUE Registry (15, 16, 18-21). Yet, the NICE Guidelines on endovascular treatment for TBAD are yet to be updated and specified per subclass.

The Society of Cardiothoracic Surgery (SCTS) and the British Vascular Society (BVS) are regulatory societies that hold limited data on patients who receive intervention. Unfortunately, both organisations fail to report specific results for AD in general and TBAD especially. For example, we do not know how many TBAD patients are treated with OMT, TEVAR, or open surgery per centre annually in the UK. We also do not know the early, midterm, and long-term patient outcomes (11).

As one of the leading countries in the field of surgery, we need a centralised database containing data with clearly defined outcomes of TBAD patients undergoing treatment in specialised centres.

Surprisingly, on term-searching the National Vascular Registry (NVR) 2019 and 2020 Annual Reports as well as the 2014 and 2018 Vascular Surgery UK Workforce Reports, there is no mention of AD, TAAD, or TBAD (22-25). The NVR is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP) and is under the auspices of the Royal College of Surgeons England (RCSEng), Vascular Society of Great Britain and Ireland (VSGBI), and British Society of Interventional Radiology (BSIR) (22,

23). Its 2019 pre-COVID report included national data collected over two years on repair of infra-renal AAAs, elective repair of complex aortic conditions, and repair of ruptured AAA. Endovascular aortic repair was performed for 62% of 3708 infra-renal AAA reported in 2018 with an in-hospital mortality of 0.4%, compared to 3.2% with open surgery (22).

## 4. Can We Learn from Other Quality Improvement Standard Protocols?

The 2012 VSGBI "Quality Improvement Framework for AAA" recommends that all elective AAA repairs are discussed in an MDT pre-operatively and that all patients receive standard preoperative assessment and risk scoring including CT/MRI imaging, as well as the involvement of a vascular anaesthetist during the peri-operative period. The NVR report states that the NHS vascular units met the above targets, with 82.5% of cases discussed during MDT meetings, 89.3% of patients having pre-operative CT/MR angiography, and 95.4% formally reviewed by the vascular anaesthetist. Yet, these numbers can still be improved (22). The National AAA Screening Programme (NAAASP) set a target of 8 weeks from date of referral to date of repair for most patients (26).

However, these standards were not met as 72 vascular units performing AAA repair reported a median delay of 60 - 90 days from vascular assessment to AAA repair, while 25% of patients at 16 vascular units waited more than 140 days in 2018. As for complex suprarenal repair, 2268 endovascular repairs were performed of which 1278 (56.7%) were fenestrated endovascular aortic repairs (FEVAR), 211 (9.3%) were branched endovascular aortic repairs (BEVAR), and 447 (19.7%) were TEVARs. The three-year data came from 73 vascular units, with 52 reporting fewer than 30 cases in total (22).

The delay trend continued with a median duration of 100-160 days from vascular assessment to surgery, excluding 9 units which reported a waiting time exceeding 220 days for 25% of their patients. Even with the NAAASP, the NVR recorded 2474 cases of ruptured AAA repairs (22). Of note, the NVR 2020 Annual Report demonstrated similar figures with some improvement in waiting times, yet still significantly below NAAASP set standards (23).

The VSBGI Vascular Surgery UK Workforce Survey 2018 (24) reflected on the previous 2014 report (25) and described how vascular surgery moved from being a subspecialty of general surgery to becoming its own specialty in 2012. It showcased the survey responses of 183 consultant vascular surgeons in the UK (compared to 382 responses in 2014), although the NVR records 522 surgeons in the UK as conducting AAA repair at the time. This equates to ratio of 1 consultant vascular surgeon per 126,000 population (66 million total population). That same year the VSGBI recommended a minimum ratio of 1 vascular surgeon per 100,000 population (24). This does not compare well to the USA who reports a ratio of vascular surgeon per capita population of 1 per 108,000 in 2008, with an increase of 25.9% in the number of board-certified vascular surgeons relative to a 9.8% rise in population since (26, 27). A country with a similar population size, demographic, and socioeconomic status to the UK is France, which had a ratio of vascular surgeon per capita population of approximately 1 per 107,000 population in 2011 (24). The 2014 report calculated a 67% increase in vascular surgery demand; however, the number of surgical care providers is clearly lagging (25).

## 5. Main Issue in the UK

No official British report exists that explicitly reports on TBAD demographics and management groups in the UK. Nonetheless, some UK centres have participated in global TBAD trials such as the INSTEAD and INSTEAD-XL led by Nienaber et al. and the VIRTUE registry (15, 16, 21). The UK Office for National Statistics (ONS) 2020 data on cause of death in England and Wales includes deaths attributed to aortic aneurysm and dissection from 1998 until 2019 without further classification (28). Most of our data on TBAD comes from the few observational studies conducted at UK centres. An example is the Oxford Vascular Study (OXVASC) whose results have been published in over 200 academic papers since it commenced in 2002 (29).

Howard et al. (12) used 10-year data from the OXVASC as well as ONS population projections to predict the incidence of acute aortic dissection in the UK over the next 40 years. TBAD comprised 28.8% of incident ADs and experienced much lower 30-day and 5-year mortality rates compared to TAAD (13.3% versus 73.0% and 33.3% versus 76.8%, respectively). The authors stated that the UK population aged 75 y and above will increase from 8 to 15% over the next 40 years, meaning that the incidence of AD might increase proportionally, unless we intervene now to control pre-morbid risk factors. The study concluded that uncontrolled hypertension is the most important treatable risk factor for aortic dissection in the UK, which also increased in prevalence over the 10-year period. Finally, it was stated that both incidence and mortality data reported in clinical studies or retrospective registries eg, International Registry of Acute Aortic Dissection (IRAD), may underestimate true numbers by incompletely reflecting on deaths prior to hospital admission (12).

## 6. Recommendations and Future Direction

It is a fact that the incidence of AD in the UK is increasing and will inevitably continue to increase unless something is done (12). The NHS strategy when dealing with AD needs to change to accommodate a more tailored approach with a structured follow up scheme for each of the subclasses of AD, with care being provided only at specialised units (30). In line with the NICOR NASCA 2020 report recommendations, the UK's specialised aortic units should be encouraged to report their audit data in a structured way to give TAAD and TBAD necessary focus which will, in turn, improve national outcomes and research output (4). Once original data from UK centres becomes available, respective societies must compile this to create a national database for each AD subclass solely, with more work required on TBAD. Sequentially, the current UK guidelines will also need to reflect the updated evidence-base. Is there a structured service line for TBAD in the UK? The answer is yes and no. There is a service line, however, this would benefit from reconfiguration (30).

## 7. Conclusions

TBAD in the UK continues to be an elusive target and a shared burden amongst all involved. Service reconfiguration with a standardised wide and applicable registry to capture patient outcome and stringent protocolisation are essential and would need to be mandated. A wide consensus amongst all different disciplines and societies would be the next step forward to refocus strategies for improved patient care.

## Footnotes

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