A Novel Device for the Prevention of Pulmonary Embolism in Trauma Patients

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Background/Purpose: Pulmonary embolism is a major cause of mortality and morbidity following major trauma. It is the third most common cause of death for trauma patients who survive the first 24 hours and has a case fatality rate of between 25% and 50%. The acute coagulopathy of trauma is now well recognized and aggressively managed with blood products; consequently this often leads to a procoagulant state after the initial resuscitation, predisposing patients to venous thromboembolism (VTE). Major trauma patients are therefore at high risk of VTE but many of the prophylactic measures may be contraindicated. Compression stockings and pumps may not be suitable in lower limb fractures and early pharmacological prophylaxis may not be possible, particularly after severe head injury or ongoing bleeding risk. This may mean the only available prophylactic measure that is effective at preventing pulmonary embolism (PE) is an inferior vena cava (IVC) filter. The side effect profile of these devices has limited widespread use and the US Food and Drug Administration (FDA) advises caution in their use. Our purpose was to report the early experiences and complication profile of the Angel® Catheter, a novel device that combines a femoral central venous catheter with an IVC filter. It can be inserted at the bedside or in theater and acts as a temporary filter for short-term use when the PE risk is very high and no other prophylactic measures can be deployed. Interventional radiology is not required for insertion. When no longer required it can be removed following a venogram to check for trapped thrombus.

Methods: A prospective cohort of 38 patients have had an Angel® catheter inserted at a single Level I UK trauma center. The criteria for insertion were that no other prophylactic measures could be deployed and the risk of VTE remained high. 3 patients had the filter deployed in theater, prior to fixation of a pelvic fracture, and the remainder in critical care.

Results: The information regarding the patients requiring an Angel® catheter is included in Table 1. All patients were severely injured, as demonstrated by the high ISSs. All insertions were successful and most were retrieved without incident. One patient died with the device in situ (not VTE- related) and in one patient the catheter was accidentally displaced but caused no vascular injury. Insertion most frequently occurred in patients with pelvic and/or spinal fractures combined with head injuries. Injuries to multiple body compartments were very common. VTE screening was not performed and no patients developed a clinical PE with the catheter in situ. Importantly, 2 patients had clinically significant clots detected within the filter on retrieval, requiring a superior filter and a period of anticoagulation. One patient had the filter removed, collapsed 48 hours later, and died from a presumed PE.

Conclusion: The Angel® Catheter is easy to insert and was, in our series, associated with no morbidity. It successfully captured 2 clots in 38 high-risk patients, presumably preventing potentially fatal PE.

See pages 49 - 106 for financial disclosure information.

Male: Female	27:11
Age	35
Median ISS (IQR)	41(26-50)
Injuries (%)	
Head	21 (55)
Thoracic	20 (53)
Spine	13 (34)
Lower Limb	22 (59)
Abdominal viscera	9 (24)
Pelvis	26 (68)
Vascular	3 (8)
Patients alive at discharge (%)	34 (89%)
Mean catheter days	7.2