



## Fatal Pulmonary Embolism Following Elective Hand Surgery

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### Abstract

We present a rare case of fatal Pulmonary Embolism (PE) following elective wrist surgery in which such a risk is statistically negligible. The patient in this case was assessed pre-operatively for the risk of Venous Thromboembolism (VTE) using existing guidelines and was found to be of low/moderate risk. Patients in the low/moderate risk group would not be routinely offered chemical VTE prophylaxis after surgery. Low Molecular Weight Heparin (LMWH) was given to this patient during their admission according to local Trust guidelines for in-patients. Despite measures being taken to prevent the risk of VTE, the patient was readmitted in a state of cardiac arrest after suffering a massive PE.

### Background

Why you think this case is important – why you decided to write it up?

The risk of Venous Thromboembolism (VTE) is recognised in lower limb surgery, especially after trauma related surgery. Upper limb surgery and more specifically hand surgery is associated with a very low risk of VTE. A recent review concluded that there is little or no evidence to suggest that upper limb surgery on its own confers a risk for developing VTE [1]. Surgeons in Europe, US and Australia use guidelines to identify patients who will likely benefit from peri-operative VTE prophylaxis. These guidelines have been widely accepted and continue to be updated both at national and professional body level [2]. In the United Kingdom, the National Institute for Health and Care Excellence (NICE) and the British Society for Surgery of the Hand (BSSH) guidelines suggest that low VTE risk patients should not be offered routine chemical VTE prophylaxis following upper limb surgery [3]. To our knowledge there have been no reports of fatal PE following elective wrist or hand surgery in the literature.

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### Case Presentation

A 75 year old lady presented with severe osteoarthritis in the right wrist, base of thumb and entrapment neuropathy (Carpal tunnel syndrome). She was admitted for a trapeziectomy with capsular flap interposition, right radial styloidectomy and right carpal tunnel decompression. The indication for this operation was severe osteoarthritis in the right wrist, base of thumb and entrapment neuropathy.

She had a history of overactive bladder for which she had been receiving 6 monthly intravesical botulinum toxin injections for seven years prior to the time of the operation. She was mildly hypertensive on medication and was taking levothyroxine for hypothyroidism. She was also known to have chronic obstructive pulmonary disease and was taking regular inhaled bronchodilators. Her Body Mass Index was 34. Pre-operative assessment included a normal full blood count and renal function tests.

The operation was performed under general anaesthesia, with a pneumatic tourniquet on the right arm at 250 mmHg and lasted 60 min. During the operation, the patient was offered mechanical VTE prophylaxis in the form of intermittent pneumatic compression devices (flowtron) on both legs. There were no problems during her recovery. After the operation she stayed in hospital for social reasons and went home on the second post-operative day. The patient was given LMWH (40 mg of Enoxaparin once a day) while she was an in-patient. The patient's mobility status was satisfactory as she was able to mobilise at home prior to admission and later on the ward postoperatively.

Two days following discharge (4<sup>th</sup> post-operative day) the patient was found collapsed at home by a family member who called an ambulance. Pulseless Electrical Activity (PEA) associated with

intermittent Ventricular Fibrillation (VF) was diagnosed and this persisted at the emergency department. During resuscitation three defibrillation shocks were delivered without return of spontaneous circulation. She was certified dead after about 10 min. The case was reported to the HM Coroner's officer. A post mortem examination was carried out and the results indicated that the lady had suffered a massive PE without an identifiable or obvious source of the thrombus. During the inquest, HM Coroner felt that despite all appropriate measures being taken, the death was connected with recent surgery and gave a narrative verdict.

## Discussion

Including very brief review of similar published cases (how many similar cases have been published?)

To the best of our knowledge at time of writing this report, there has been no published report of a fatal PE following elective wrist surgery. Roberts and Warwick 2012 reviewed more than 700 articles and found nine cases of VTE following upper limb surgery. Five cases of development of PE (one fatal) after upper limb surgery were identified but they followed elbow or forearm surgery. Sweetland et al. [4] stated that the risk of VTE is substantially increased in the first 12 weeks postoperatively and varies considerably with the type of surgery estimated to 1:45 females after hip or knee surgery, 1:85 after cancer surgery, 1:815 after day case surgery in comparison to 1:6200 without surgery. In a large prospective study where close to a million female subjects were followed over a year, they found that the risk of VTE is significantly high in the immediate post operative period and remained raised for up to 12 weeks, with a peak period of incidence in the third postoperative week. While the relative risk of VTE is lower in day case surgery, the study concludes that the overall risk of VTE is high following both day case procedure and inpatient cases when compared to the general population who had not had a surgical procedure. What is also interesting to note in the results from this study was the substantially higher risk of postoperative pulmonary embolism diagnosis, relative to deep venous thrombosis, which appeared to be the eventual postmortem diagnosis in our case [4].

The NICE guidelines describe factors which categorise surgical patients into low, medium or high risk for VTE. Wrist and hand surgery fall under low risk for VTE. The available guidelines do not recommend routine chemical VTE prophylaxis for patients in the lower risk groups.

The British Society for Surgery of the Hand (BSSH) developed comprehensive guidelines on VTE prophylaxis for upper limb surgery. These were communicated to the members of the society and made available through the society's website ([www.bssh.ac.uk](http://www.bssh.ac.uk)) but have not been published in the literature [5].

The guidelines categorise patients into no risk, low/moderate and higher risk. The patient that we are reporting was assessed to fall in the low to moderate group; upper limb surgery that lasted less than 90 min, with an identifiable risk factor [3].

Guidelines in Europe and worldwide (ICS, ACCP, AAOS, ICSI, NHMRC, ANZWP) either recommend that VTE risk factor analysis should be considered at individual patient basis or do not mention upper limb surgery at all.

Having reviewed the guidelines and literature, it appears evident that upper limb surgery confers a minimal risk of VTE and in particular, wrist surgery presents a very small if not negligible risk. This case would be the first report to be published in the literature of a fatal PE following elective hand surgery. It is known that fatal VTE can occur spontaneously and in the absence of any significant risk factors. This uncertainty makes it impossible to prove or disprove that elective hand surgery would have been a causative factor for the development of VTE in this case but the fact remains that VTE can indeed occur under such circumstances.

We therefore conclude that patients should always be made aware of the relatively rare risk of development of VTE after hand surgery, while clearly being informed of the general risk relating to all forms of surgical procedures. Clinicians should consider documenting the VTE risk assessment discussions with the prophylactic measure taken in the patient's records. We strongly recommend adherence to both local and internationally recognised VTE prophylaxis guidelines for all patients undergoing elective hand surgery.

## Learning Points/Take Home Messages

- VTE remains a major concern as a complication of orthopaedic surgery and upper limb surgery is no exception.
- Current guidelines do not recommend routine administration of chemical VTE prophylaxis for low or moderate risk patients undergoing wrist and hand surgery.
- All patients should be assessed for VTE risk at individual basis and decisions should be documented in the patient's records.

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