Received: 2 May 2023 | Accepted: 22 December 2023

DOI: 10.1111/ors.12870

ORAL SURGERY

CASE REPORT

Deep vein thrombosis and bilateral submassive pulmonary emboli post-routine sinus lift: A case report and review of the literature

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Abstract

Venous thromboembolism (VTE) arising after major oral surgery under general anaesthesia is an exceedingly rare occurrence, and under local anaesthesia even more so. We report a case of a 55-year-old male with a remote history of squamous cell carcinoma of the left tonsil, in remission, who developed deep vein thrombosis and bilateral pulmonary emboli after routine sinus lift under local anaesthetic. We discuss the diagnosis, risk factors, and the role of sinus lift in contributing to the onset of VTE in this report. We also discuss a role of potential thromboembolic prophylaxis in high-risk patients undergoing dentoalveolar procedures under local anaesthetic.

KEYWORDS

deep vein thrombosis, local anaesthesia, pulmonary embolism, sinus lift

INTRODUCTION

Venous thromboembolism (VTE) encompasses both deep vein thrombosis (DVT) and pulmonary embolism (PE). VTE is a common condition that affects nearly 10 million people worldwide every year.[1] Incidence is 1–2 cases per 1000 population, observed mostly in patients older than 55 years and exponentially increasing with age in general.[2,3] It contributes considerably to the global burden of disease, costing 13.5 to 27.2 billion dollars in the United States alone.[4] Even though the VTE-related mortality rate has been decreasing in the last 16 years, approximately 20% of patients die within 1 year of diagnosis, with higher risk attributed to those with more severe disease, cancer, or cardiovascular comorbidities.[5–9] VTE can be categorized as provoked or unprovoked. Although most cases are unprovoked, two of the major causes for provoked VTE are major surgery or active cancer.[8]

We report a patient with right leg distal DVT and bilateral submassive pulmonary emboli post-routine maxillary sinus lift under local anaesthesia. The occurrence of venous thromboembolism as a direct result of oral and maxillofacial procedures is a rare occurrence with only a handful of cases reported in the literature.[10,11] There have been reported cases of VTE arising after major oral surgeries including bilateral sagittal split, Lefort osteotomies, or pre-prosthetic surgeries.[12–14] In this report, an attempt will be made to describe the role of maxillary sinus lift in contributing to the onset of pulmonary embolism, risk factors that may have increased the risk of onset, and potential role of thromboembolic prophylaxis pre- or post-op.

CASE PRESENTATION

A 55-year-old male with hypothyroidism and T3N1 squamous cell carcinoma of left tonsil and neck in remission, status post-chemotherapy and radiation completed 7 years before presentation, presented to our clinic for oral surgery consultation. Past surgical history included left and right knee arthroplasties in 1989. He was allergic to penicillin. He has never smoked, drunk alcohol, or used recreational drugs.

The patient's chief complaint pertained to missing the upper right first molar. Restorative options were discussed including no treatment, partial denture, bridge, or implant. He opted for implant restoration.

The risk of developing osteoradionecrosis (ORN) post-implant placement in the setting of radiation exposure was considered. However, the exposed dose of 3500–4200 cGy in the maxilla presented minimal risks of ORN post-op.[15–20] Initial examination revealed pneumatization of the right sinus at the first molar with only 5.7 mm of available residual ridge height evident from CBCT measurements. This placed the given case as a Misch SA3 maxillary sinus classification.[21] Given the lack of residual maxillary bone height in the area, sinus augmentation was necessary prior to implant placement.[22–24] Otherwise, there were no contraindications to treatment.

Lateral sinus lift was performed with contour graft under local anaesthetic while the patient was placed in a semi-reclined position on a dental chair. The procedure was uncomplicated and lasted approximately 60 min. There was no additional leg support (ie. foam rollers, rolled towels) provided. The patient was prescribed trimethoprim-sulfamethoxazole as routine post-op infection prophylaxis due to his penicillin allergy.

One week post-op, the patient developed left-sided chest and back pain for 2 nights, which lasted a number of hours. He developed haemoptysis. The pain worsened and the patient eventually presented to his local emergency department. Upon presentation, he complained of significant chest pain, which worsened with movement and breathing. There was ongoing pain in the midfoot and tenderness in the right calf.

Laboratory tests revealed haemoglobin 156 g/L, neutrophil count of 5.1×10^9/L, lymphocyte count of 0.8×10^9/L, random blood glucose level of 7.8 mmol/L, total platelet count of 270×10^9/L, elevated D dimer of 4275 µg/L {FEU}, and lactate dehydrogenase of 185 U/L. Liver and kidney function tests were within normal limits.

CT pulmonary angiogram showed moderate to high burden of pulmonary emboli bilaterally, in both lobar and segmental branches (Figure 1). There was radiographic evidence of right ventricular strain. He was started on therapeutic anticoagulation with IV unfractionated heparin and transferred to a tertiary care hospital. Doppler ultrasound of the lower extremities showed a short-segment occlusive thrombus in the right posterior tibial vein, not extending to the popliteal vein. The rest of the deep venous system was patent bilaterally. He responded to treatment with anticoagulation and was transitioned to apixaban prior to discharge. 5 months later, a repeat blood test revealed a normal D-Dimer value of 235 µg/L {FEU}. On a 5-year follow-up chest CT, no evidence of emboli was present (Figure 2).

Subsequent follow-up visits with haematology established the patient's VTE event as provoked, with his sinus lift procedure as the only provoking factor. Specifically, he had no prior personal or family history of VTEs, his prior cancer was still in remission as confirmed by a PET scan performed 1 month after the VTE event, he was not immobilized in the post-op period, he did not suffer any trauma or require casting of his legs, he had not undertaken any long-duration travel, he was not using anabolic steroids, and he had no history of varicose veins. He was normotensive and had no previous cardiac history. Patient's BMI at the time of the incident was 21.2 with height of 188 cm and weight of 75 kg, although his stable weight is around 90 kg. He led an active lifestyle, frequently participating in marathons.

The consulting haematologist recommended extending the duration of therapeutic anticoagulation to 6 months due to the large pulmonary clot burden and that the patient should receive apixaban 2.5 mg bid post-operatively as prophylaxis against recurrent VTE events.

Clinical Relevance

VTE as a result of major oral and maxillofacial surgeries under general anaesthesia is a rare complication, and under local anaesthetic even more so. We report what may be the first reported case of a patient who developed VTE after routine sinus lift under local anaesthesia. In the general outpatient population without known risk factors for VTE, prophylactic anticoagulation in the postoperative period for such a procedure would not be warranted. However, careful consideration of risk factors, particularly personal and family history of VTEs, and any history of malignancy, should be undertaken.

DISCUSSION

VTE is an umbrella term that includes both pulmonary embolism and deep vein thrombosis. When PE occurs, it is usually preceded by DVT from the lower extremities, although DVT can occur in veins of the arms, abdomen, or head.[8] After having suffered a single episode of VTE, recurrent venous thromboembolism and bleeding risk due to chronic anticoagulation are causes for concern. In addition, much of the morbidity of DVT arises from post-thrombotic syndrome (PTS), which is characterized by signs and symptoms of chronic venous insufficiency including mild ankle oedema, venous claudication, and leg ulcers in severe cases. One of the chronic complications of pulmonary embolism includes post-pulmonary embolism syndrome, in which chronic thromboembolic pulmonary hypertension is the primary manifestation.

Risk factors for VTE were first categorized by Virchow into three broad classes: venous stasis, hypercoagulability, and injury to the vascular endothelium.[25] The risk of VTE increases with advanced age, length of anaesthesia, prolonged immobility, previous history of VTE or cancer, smoking habit, obesity, rheumatic immune disease, and respiratory failure.[26,27] It is estimated that the risk is <3% in patients who are <40 years old and undergoing general surgery lasting less than 30 min.[27,28]

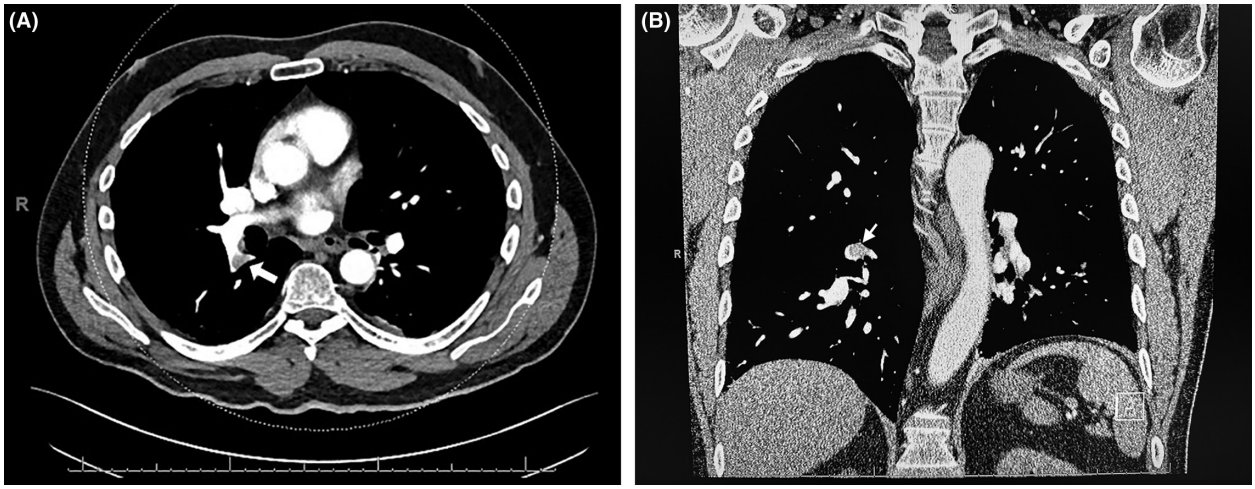

FIGURE 1 (A) Axial and (B) coronal CT pulmonary angiograms demonstrated bilateral lobar and segmental pulmonary emboli with high clot burden (white arrows). Obtained May 2019.

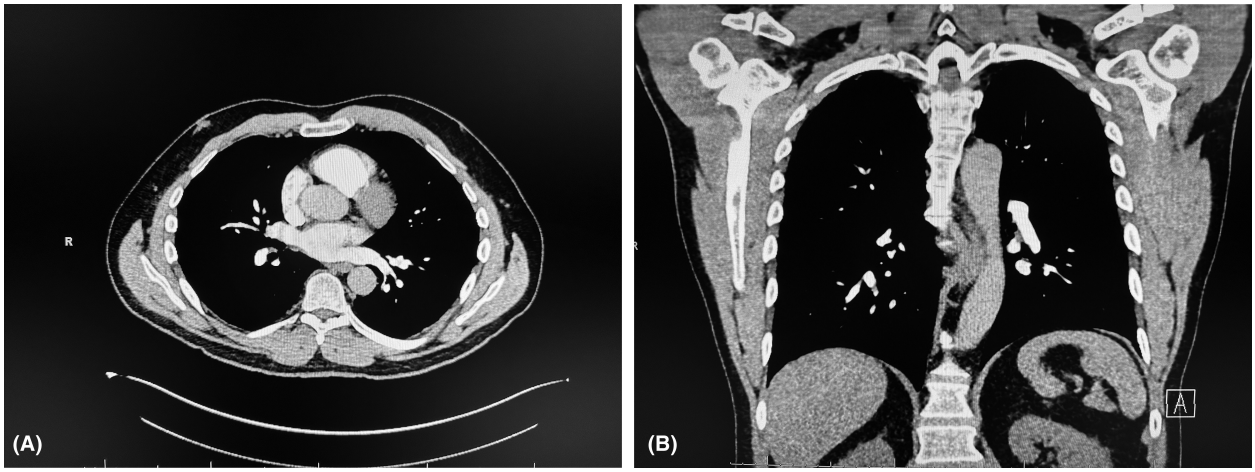

FIGURE 2 (A) Axial and (B) coronal repeat CT pulmonary angiogram demonstrated the resolution of clot. Obtained June 2023.

Radiation-induced vascular injury is a potential risk factor to be considered in our specific case. There have been a number of studies emphasizing the pathogenic impact of radiation therapy on endothelium dysfunction thereby increasing the long-term risk of cardiovascular diseases, and in fact, a higher incidence of arterial stenosis was found in patients receiving head and neck radiotherapy through the formation of atherosclerotic plaques.[29,30] The exact pathophysiology of radiation-induced arterial disease is unknown. However, studies have shown radiotherapy triggers a cascade of pro-inflammatory reactions leading to increased endothelial permeability and induction of inflammatory cell infiltration within the arterial wall, ultimately resulting in the formation of atherosclerotic plaque. There has also been a suggestion of adventitial fibrosis producing extrinsic compression as well as ischemic necrosis of the vasa vasorum and subsequent fibrosis of the vessel wall.[31,32] Given these vessel wall changes, it is possible the fractionated head and neck radiation therapy could have increased the predilection for thrombosis.

VTE is an uncommon sequela after routine dental procedures. To date, there is no established literature which describes the incidence of VTE in the setting of dental procedures, although there have been some reported cases of pulmonary embolism in patients undergoing oral and maxillofacial surgeries. Forouzanfar et al. reported two patients who developed VTE in a retrospective study involving 411 patients. Incidence was found to be 0.5%, and a relationship between body mass index and hospital stay with thromboembolism was found.[13] Verlinden and colleagues also conducted a similar retrospective study, which found two patients with symptomatic venous thromboembolism over a 42-year period.[14] Samieirad et al. described a case of a 21-year-old female with class III malocclusion developing DVT 1 week after the bimaxillary orthognathic surgery.[12]

Our patient's sinus lift procedure is not traditionally recognized as a high-risk surgery warranting postoperative VTE prophylaxis.[33] Nonetheless, its temporal correlation to the VTE event made it the only provoking factor identified.

In such cases, clinicians may be tempted to test for hereditary VTE risk factors, such as Factor V Leiden, prothrombin G20210A mutation, protein C deficiency, protein S deficiency, and antithrombin deficiency. However, Thrombosis Canada does not recommend routine testing for these inherited thrombophilias, because testing does not change clinical decision-making or reduce adverse outcomes.[34] On the other hand, a negative test may falsely reassure patients who have suffered a VTE and have other unknown, untestable risk factors that put them at high risk of recurrent events. Evidence suggests heterozygotes for Factor V Leiden and the prothrombin G20210A mutation are not at significantly increased risk of recurrent VTE, but a positive test could nonetheless negatively impact the way the patient views their health and affect eligibility for life and disability insurance. Our patient was not tested for these inherited thrombophilias.

Could this patient have the antiphospholipid syndrome (APS)? APS is an acquired thrombophilia characterized by venous and arterial thrombosis, and diagnosis is based on positive lab criteria (the presence of a lupus anticoagulant, anticardiolipin antibodies, and/or anti-beta-2-glycoprotein antibodies), clinical criteria (venous, arterial, and small vessel thrombosis), and obstetrical criteria where applicable.[35] Guidelines suggest that testing for the lupus anticoagulant be limited to those with a significant pre-test probability of having APS or those who have unexplained prolonged aPTT. Testing during acute VTE events is likely to result in uninterpretable results, due to the effects of treatment with heparin and vitamin K antagonists.[36] Our patient did not meet the threshold for testing for APS.

Provoked VTEs are generally treated for at least 3 months with therapeutic anticoagulation, with reassessment of thrombosis and bleeding risks at that time to decide on stopping or extending treatment. Data to support this pattern of practice comes from a meta-analysis showing similar rates of VTE recurrence between those treated for 3 months versus 6 months.[37] This patient received 6 months of anticoagulation due to the high burden of pulmonary emboli.

The patient stopped anticoagulation after 6 months and has returned to his prior level of functioning, with no recurrence of VTE 2 years after the index event. His history of provoked VTE is a strong risk factor for subsequent thromboembolic events. He was therefore recommended to take prophylactic anticoagulation with apixaban 2.5 mg p.o. b.i.d. for 6 weeks after any surgery.

In general, VTE is a rare complication of major oral and maxillofacial surgery requiring general anaesthesia care. We share what may be the first reported case of VTE arising from a dentoalveolar procedure done under local anaesthesia. In the general outpatient population without known risk factors for VTE, prophylactic anticoagulation in the postoperative period for such a procedure would not be warranted. However, careful consideration of risk factors, particularly personal and family history of VTEs, and any history of malignancy, should be undertaken.

FUNDING INFORMATION

There was no source of funding received in writing this report.

CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interests.

DATA AVAILABILITY STATEMENT

Not applicable.

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How to cite this article: Kim DH, Zhao EJ, Tong N, Yang DH. Deep vein thrombosis and bilateral submassive pulmonary emboli post-routine sinus lift: A case report and review of the literature. Oral Surg. 2024;00:1–5. https://doi.org/10.1111/ors.12870