

# Fourier Transform Infrared spectroscopy with multivariate analysis during anticoagulation for venous thromboembolism identifies patients at risk of future recurrence

Northern Health

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RESEARCH WEEK

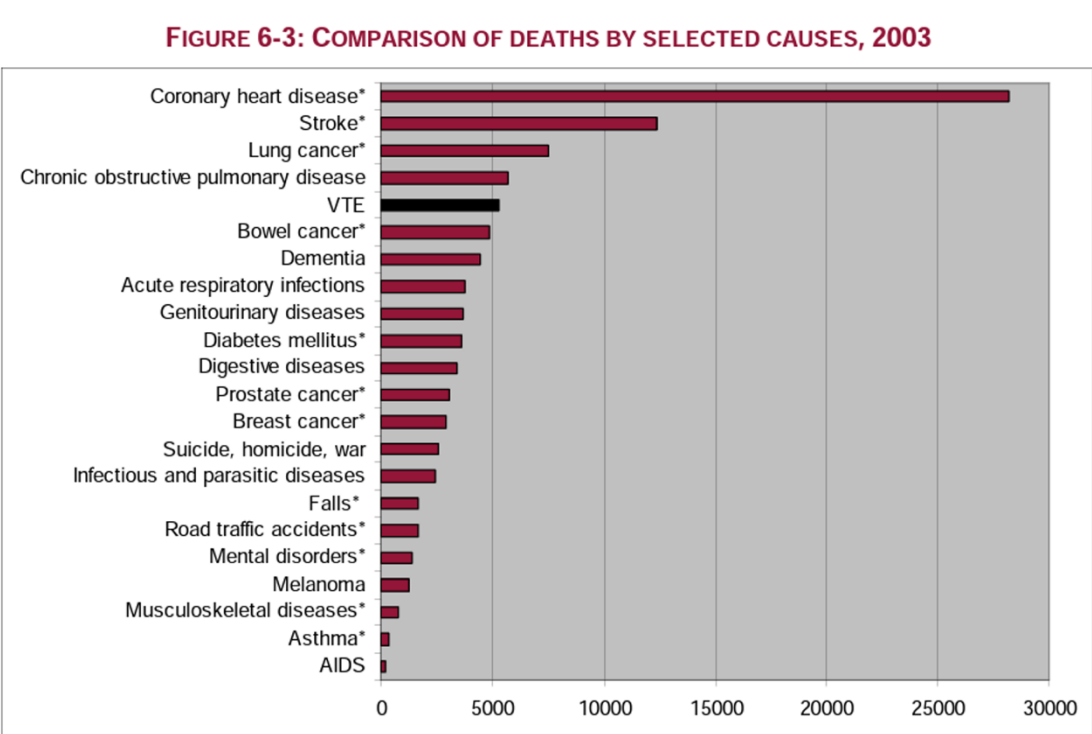
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## BACKGROUND

Venous thromboembolism (VTE) remains a major global health concern. Biomarkers may help to identify individuals at high risk for future VTE recurrence and inform the duration of anticoagulation therapy. However, many biomarkers are affected by the presence of anticoagulation, and can hamper risk assessment.



## AIM

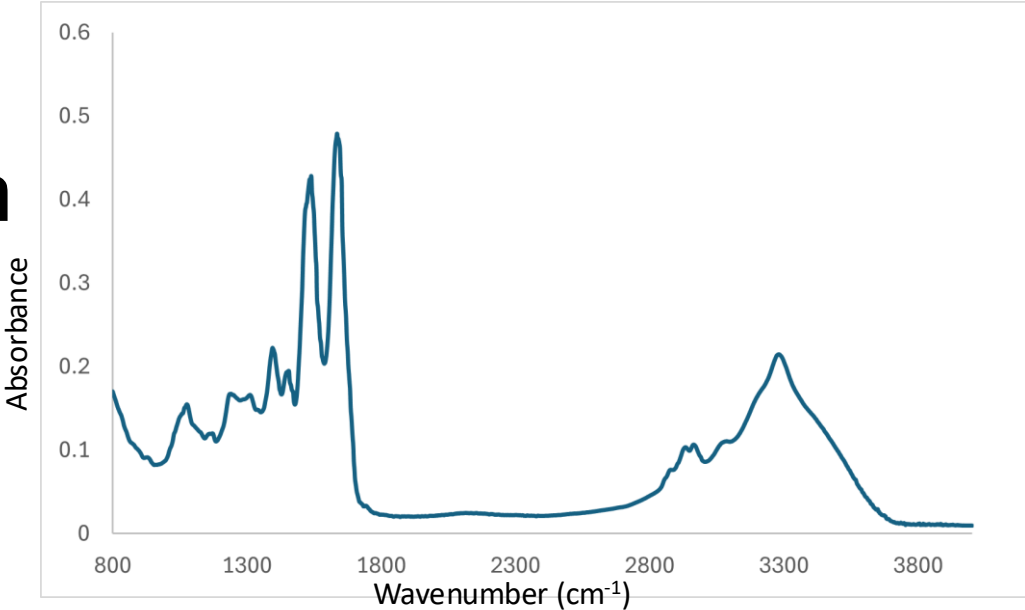
Use Fourier Transform Infrared (FTIR) spectroscopy to interrogate the plasma of VTE patients collected during anticoagulation therapy, to identify any differences in patients who later developed VTE recurrence following anticoagulation cessation.

## METHODS

Citrated plasma was collected from VTE patients around 3 months after VTE diagnosis and whilst therapeutically anticoagulated. FTIR was performed on plasma from patients who subsequently stopped anticoagulation and were followed for up to 3 years after stopping anticoagulation.

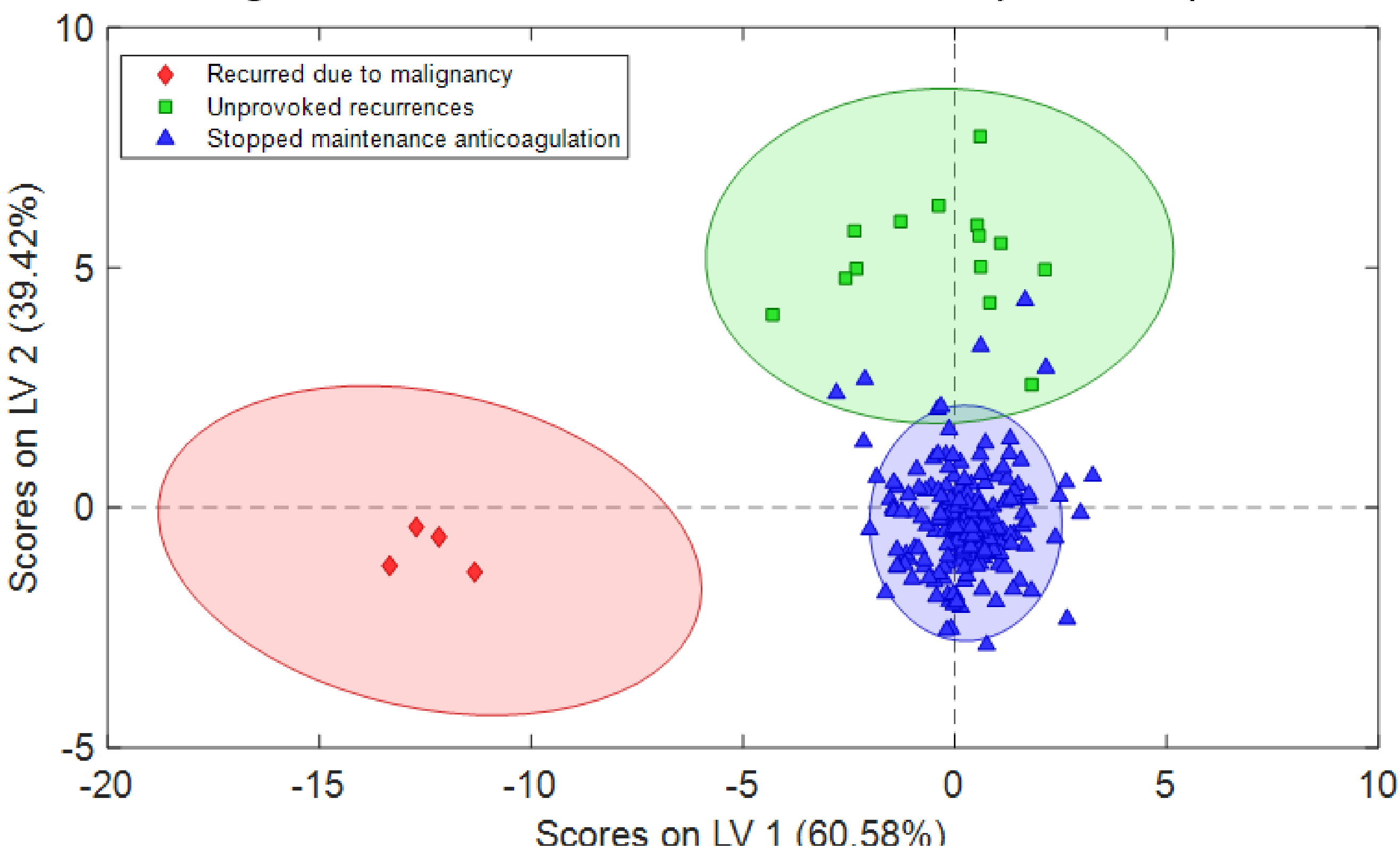


## Fourier transform infrared (FTIR) spectroscopy



Subgroups of interest were patients who developed VTE recurrence (unprovoked or due to malignancy). FTIR spectra were acquired using a Perkin-Elmer Spectrum 3 FTIR spectrometer, examining the mid-infrared range (900–4000 cm<sup>-1</sup>) at a resolution of 4 cm<sup>-1</sup> with duplicates per sample. FTIR spectra were analysed using Partial Least Squares Discriminant Analysis (PLSDA), and the resulting model performance was assessed in terms of specificity and sensitivity.

Figure 1: Multivariate models of FTIR spectra of plasma



## RESULTS

117 VTE patients were included, of whom 2 developed VTE recurrence due to malignancy, and 7 had unprovoked VTE recurrences during the follow-up period. Spectral analysis was able to distinguish between those who recurred due to malignancy (sensitivity 75%, specificity 99%) and those with unprovoked recurrences (sensitivity 50%, specificity 96%) from patients without VTE recurrences.

## CONCLUSIONS

FTIR spectroscopy performed on the plasma of anticoagulated VTE patients, combined with multivariate analysis, identified patients who later developed unprovoked or malignancy-provoked recurrent VTE after the cessation of anticoagulation. This suggests that spectroscopy during anticoagulation may be a potential tool to assist in clinical risk stratification. Further studies are necessary to expand upon these initial findings.

## REFERENCES

- Access Economics Pty Ltd for the Australia and New Zealand working party on the management and prevention of venous thromboembolism. The burden of venous thromboembolism in Australia, 1 May 2008. Access Economics Pty Ltd; 2008.
- Wang J et al. Overall haemostatic potential (OHP) assay can risk stratify for venous thromboembolism recurrence in anticoagulated patients. *J Thromb Thrombolysis* 2023; 55: 32-41