

# Beyond DVT Detection: A Paediatric Case Study on Advanced Ultrasound Diagnostics and Patient-Centered Care

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## Introduction

Deep venous thrombosis (DVT) is a common complication, that remains a challenge to physicians to diagnose clinically due to the lack of presentation of oedema, warmth, pain, erythema, that presents to only 23%-50% of patients<sup>[1]</sup>. Ultrasound plays a crucial role in diagnosing DVT in adults and children<sup>[2]</sup>. However, when the results of the originally requested ultrasound scan are inconclusive or do not match the clinical presentation, sonographers are encouraged to understand the patient's needs using adapted communications skills, verbal or non-verbal base on the individual needs as it's expected by the Health and Care Professional Council standards<sup>[3]</sup>.

## Background and Clinical Presentation

A fourteen-year-old patient with a background of 22q11 deletion syndrome and complex cardiac and neurological background, who underwent aortic and pulmonary valves replacement surgery five days prior to the ultrasound scan. The indication given was to rule out DVT as the patient developed swelling in the right lower leg<sup>[4]</sup>. DVT in the paediatric population is rare but has potentially serious consequences such as pulmonary embolism and post-thrombotic syndrome, so early and accurate diagnosis is essential.<sup>[5]</sup>

Additional information obtained at the time of examination, by the accompanied nurse, was that the patient had an emergency venous cut down procedure to expose and cannulate a vein for immediate intravenous access during his recent cardiac surgery the day before.<sup>[6]</sup> Although most incidences of DVT in children are associated with central venous catheterization, there are many other risk factors to consider in paediatrics including surgery and trauma.<sup>[5]</sup> In paediatric patients with DVT, symptom development is often subtle with the most commonly reported symptom being unilateral limb swelling as reported in this case.<sup>[5]</sup> Ultrasound is the first line imaging modality in cases of suspected DVT so an urgent ultrasound examination was clinically indicated in this case.

## Equipment and Technique

A full venous assessment was performed of the right leg initially. Baseline images were recorded according to our local protocols from a dedicated ultrasound machine (RS85 Prestige, Samsung Medison Co., Ltd., Korea). Various probes (LA2-14A & L3-22, Samsung Medison Co., Ltd., Korea) were used on B mode with color and spectral ultrasound and there was no evidence of a DVT. The clinical presentation of swelling, erythema, warmth and by using non-verbal communication skills, the patient indicated the area of most pain, so the examination was extended to try to help the patient with an accurate diagnosis. Non-verbal communication skills in paediatrics are particularly important<sup>[7]</sup>.

Lymph nodes are frequently seen in paediatric patients and appear as oval hypoechoic structures with an echogenic linear hilum which demonstrates hilar vascularity on colour Doppler as seen on Image 1a.<sup>[2]</sup>

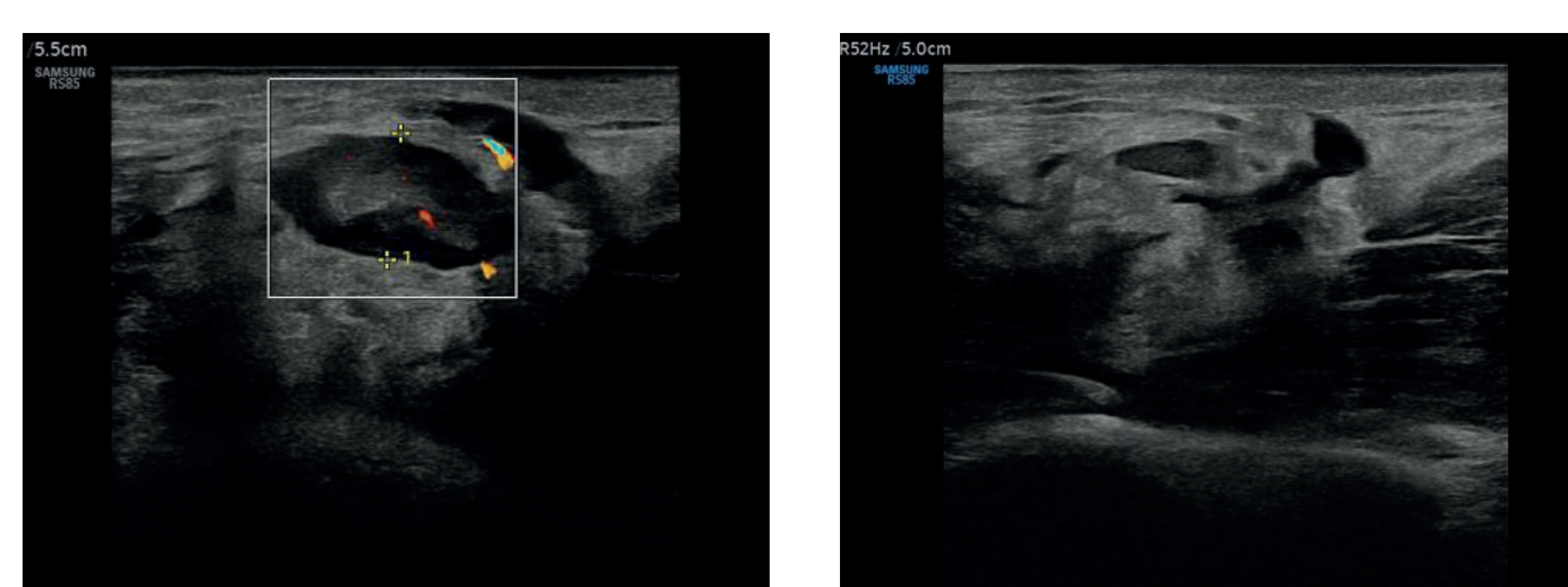


Image 1a: Right Groin Lymph Node 1.1cm

Image 1b: Right Groin Free Fluid

After a normal DVT assessment, the patient was asked to localize the source of pain and indicated the right groin. The superficial area of swelling correlated to a morphologically normal lymph node (Image 1a) with a trace of free fluid around it (Image 1b).

The free fluid was then examined in an attempt to further characterise and determine the origin; the free fluid was seen to extend into an abnormal heterogeneous collection which contained echogenic contents (Image 1b and 2a).

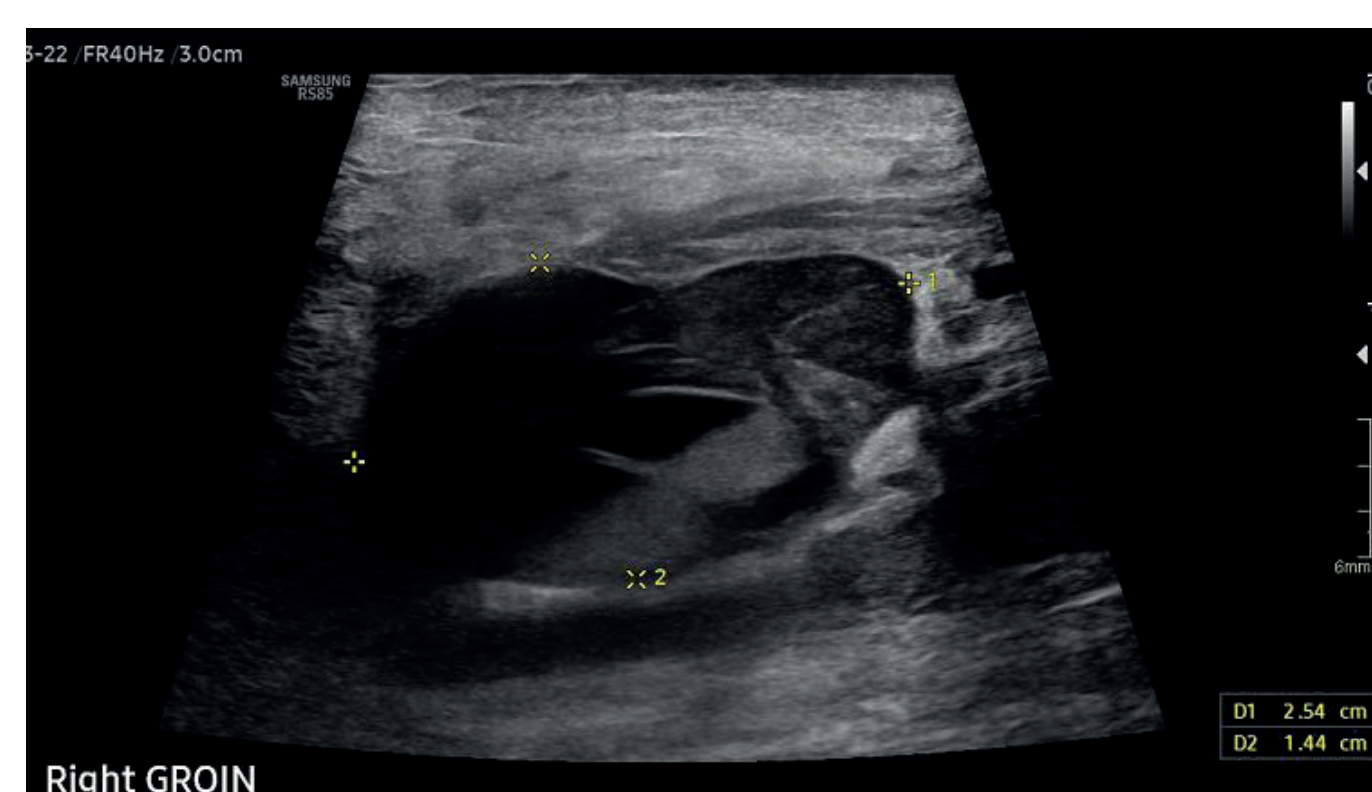


Image 2a: Right Groin Heterogeneous Collection

Due to limited access caused by surgical dressings, a smaller linear probe (Samsung L3-22) was used to assess the superficial area of concern and further evaluate the above findings (Image 1b) and a large well defined heterogeneous collection measuring 2.5 cm x 1.4 cm was seen (Image 2a).<sup>[5]</sup> The ultrasound appearances<sup>[2,8]</sup> and clinical history gave a preferred diagnosis of post operative haematoma following an emergency venous cut down procedure during cardiac surgery.

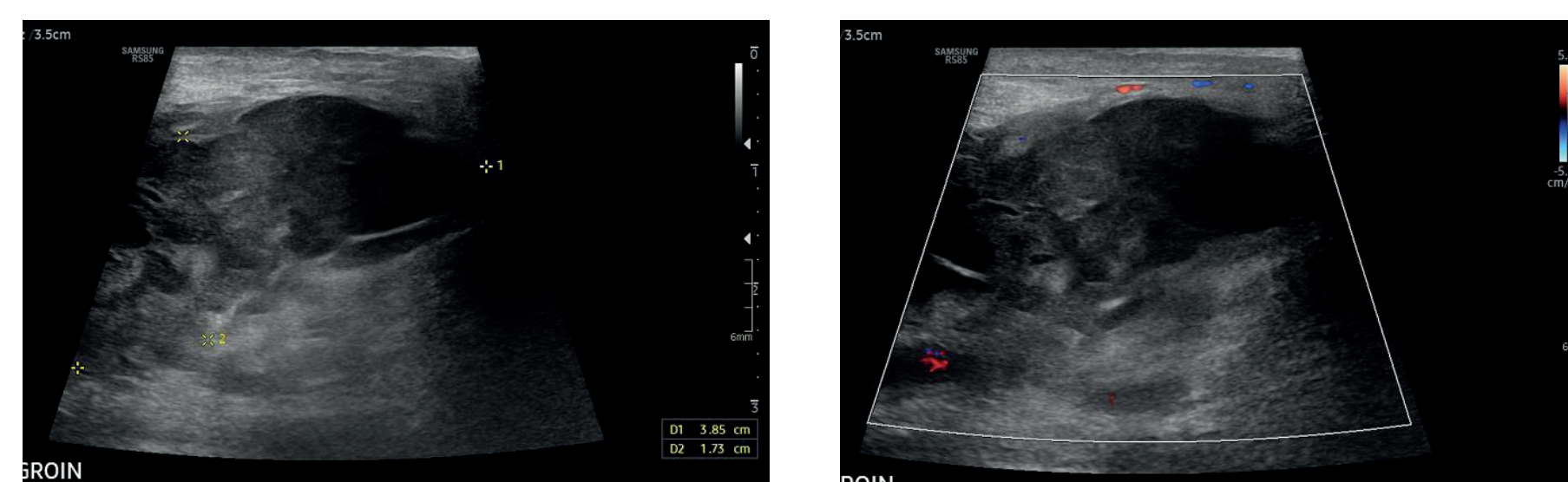


Image 3a: Right Groin Deep Haematoma

Image 3b: Right Groin Avascular Haematoma

In the longitudinal plane the above 2.5 cm x 1.4 cm haematoma was further investigated and had a deeper and larger extension measuring 3.9 cm x 1.7 cm (Image 3a). No vascularity was detected within on colour Doppler (Image 3b).

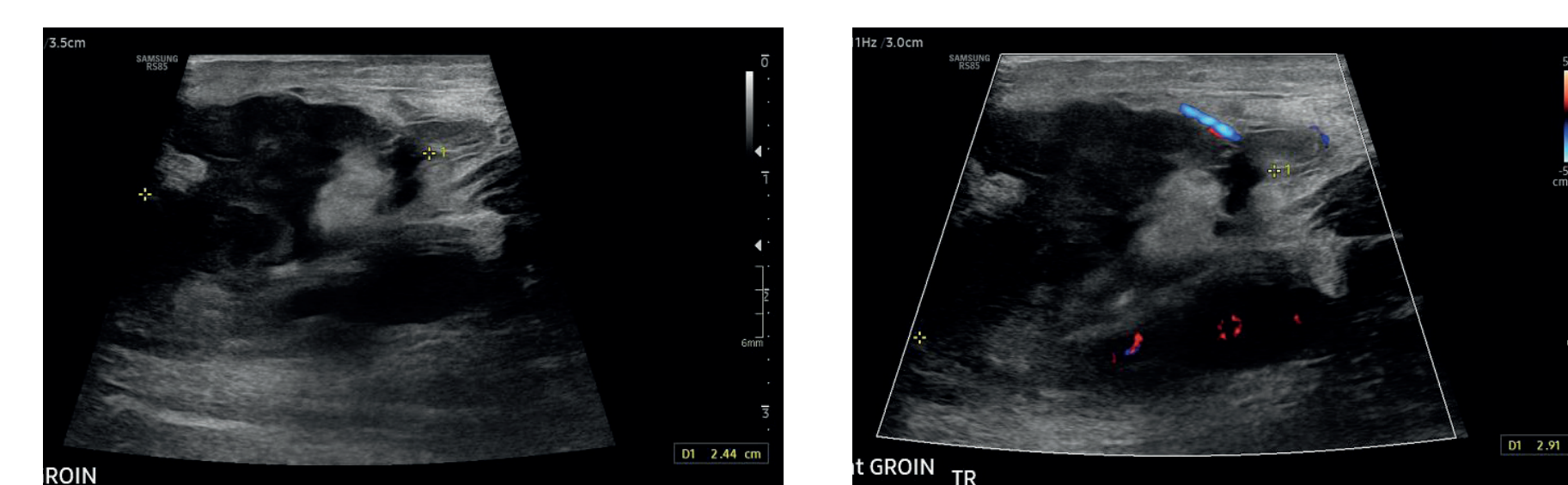


Image 4a: Right Groin Deep Haematoma

Image 4b: Right Groin Avascular Haematoma

Image 4 (a and b) illustrate the large extension of the haematoma in the transverse plane with areas of anechoic and echogenic changes suggestive of a recent large haemorrhage post the emergency 'cut down' procedure.

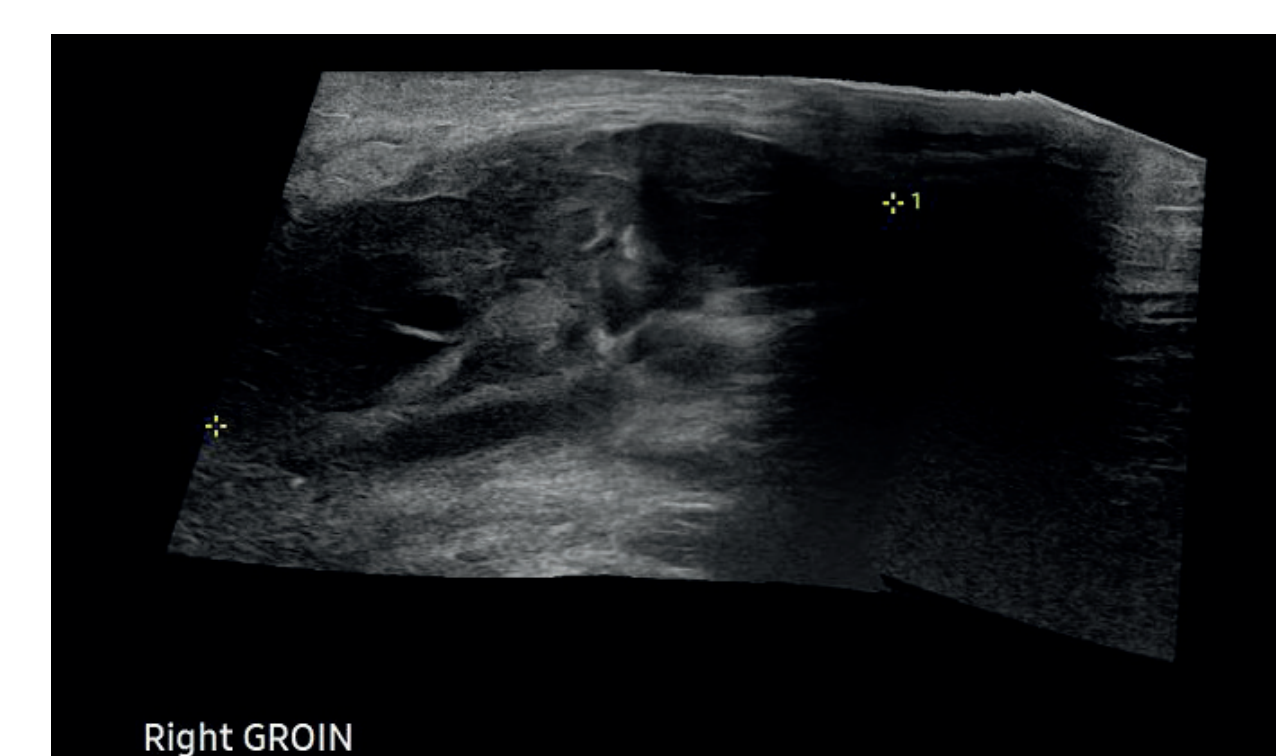


Image 5a: Panoramic View of the Extension of the Haematoma 4.9 cm

Image 5a demonstrates the extent of the haematoma measuring maximally 4.9 cm using a panoramic setting, revealing that the initial cystic haematoma measuring 2.5 cm x 1.4 cm had a much deeper extension when different smaller footprint probe was used.

## Conclusion

This case illustrates how thorough sonographic examination, adaptive communication, and advanced imaging can lead to accurate diagnoses, even in cases where initial findings may be inconclusive. The use of multiple high-frequency probes, tailored to the specific anatomical and post-surgical context, ensure a comprehensive diagnosis without requiring additional imaging.

## Take Home Message

Effective sonography relies on technical skill and a human-centered approach. By spending time to engage with the patient, interpreting both verbal and non-verbal cues, sonographers can significantly impact patient outcomes. This case underscores the value of customised imaging techniques and communication skills in delivering accurate, compassionate care.

## References

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