

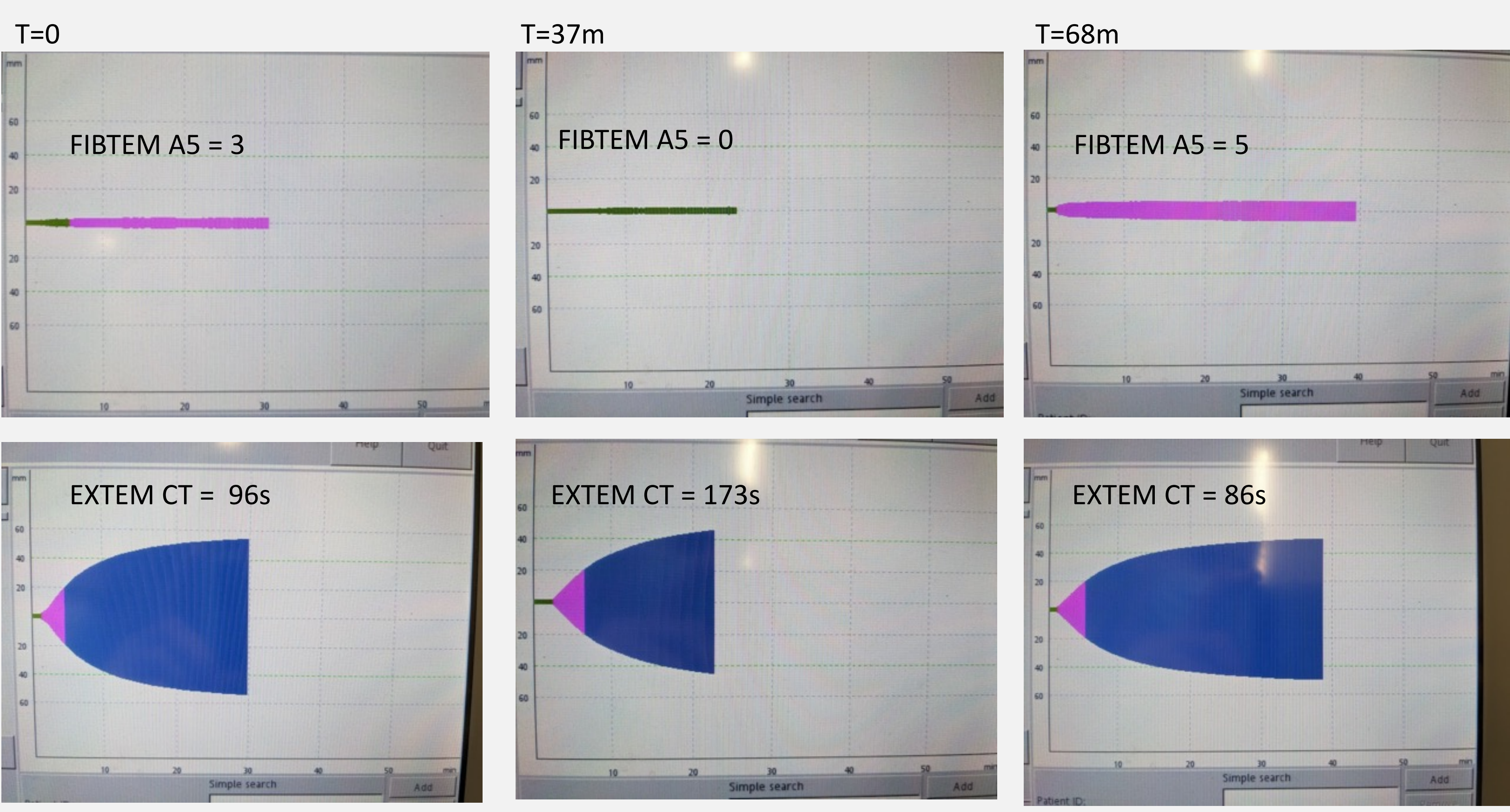
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## Introduction

Placental abruption can cause a rapidly progressive coagulopathy. This as due to simultaneous consumption and depletion of clotting factors, leading to systemic hyperfibrinolysis.<sup>1</sup> This case describes early detection of severe coagulopathy following suspected abruption, which facilitated prompt decision making around the mode of anaesthesia and early replacement of clotting factors.

## Case report

A 25-year-old multiparous female of 31 weeks gestation presented to delivery suite with cramping abdominal pain. Initial obstetric assessment did not reveal a definite diagnosis, but placental abruption was considered. Rotational Thromboelastometry (ROTEM) was offered by the anaesthetic team to facilitate work up. Escalating abdominal pain and a deteriorating CTG led to a category one caesarean section. The first ROTEM (t=0) demonstrated a FIBTEM A5 of 3mm and an initially unrecordable EXTEM CT (t=0). This prompted general anaesthesia, major haemorrhage protocol activation, administration of tranexamic acid (TXA) and a request for 6g fibrinogen concentrate as per the Obstetric Bleeding Strategy (OBS) Cymru guidelines.<sup>2</sup>



Repeat ROTEM (t=37m) performed whilst awaiting fibrinogen concentrate showed a FITEM A5 of 0 and EXTEM CT 173s. An increase from 0 to 5mm in the FIBTEM A5 was seen following 6g fibrinogen concentrate, prompting further replacement. The OBS Cymru guideline was used to guide blood product replacement targeted to repeat ROTEM results, aiming for a FIBTEM A5 of >11mm.<sup>2</sup> Placental abruption was confirmed during surgery. Couvelaire uterus – bleeding penetrating to the myometrium hindering uterine contraction - developed requiring further uterotonics and consideration of hysterectomy. Persisting coagulopathy favoured further ROTEM guided correction alongside insertion of Bakri balloon, B-lynch suture and vaginal pack. 18g of fibrinogen concentrate was required in total, exhausting hospital fibrinogen concentrate supply. Additional blood products given included four units packed red cells, two units fresh frozen plasma (FFP) and one pool platelets. Measured intraoperative blood loss was 2200ml. The patient was extubated in theatre, and she was eventually discharged home with a well baby following a period of inpatient observation.

| Management considerations |                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coagulopathy              | <ul style="list-style-type: none"><li>ROTEM guided correction of coagulopathy with fibrinogen concentrate</li><li>Early administration of TXA with repeated doses due to persisting fibrinolysis</li><li>Use of FFP for volume and as fibrinogen concentrate exhausted</li><li>Consideration of cryoprecipitate</li><li>Awareness of dilutional effects multiple blood products</li></ul> |
| Uterine tone              | <ul style="list-style-type: none"><li>Couvelaire uterus</li><li>Uterotonics: 10units syntocinon, 1mg ergometrine, 2mg carboprost, syntocinon infusion</li></ul>                                                                                                                                                                                                                           |
| Anaesthetic               | <ul style="list-style-type: none"><li>Use of depth of anaesthesia monitoring to reduce volatile anaesthetic</li><li>Change to total intravenous anaesthesia</li></ul>                                                                                                                                                                                                                     |
| Surgical                  | <ul style="list-style-type: none"><li>Local haemostasis</li><li>Use of intra-uterine tamponade balloon, B lynch suture</li><li>Consideration of hysterectomy</li><li>(cell salvage)</li></ul>                                                                                                                                                                                             |

## Discussion

Fibrinogen has an extremely important role in coagulation. Low levels of fibrinogen <2g/L have been shown to have a 100% association of progression to severe post-partum haemorrhage (PPH) and a 2.6 fold increase in the incidence of severe PPH per 1g/L decrease in fibrinogen.<sup>3</sup> Rapid consumption and depletion of fibrinogen can require large amounts of replacement. Fibrinogen concentrate contains 20g/L fibrinogen, compared to approximately 2.6g/L in FFP.<sup>4</sup> 18g of fibrinogen would have equalled a volume of around 6900ml FFP. This would have likely resulted in circulatory overload and ventilation on intensive care as described in previous case reports.<sup>5</sup> It is also possible ROTEM targets may not have be met due to the lower concentration, prompting administration of further blood products compounding circulatory overload. Caveats to fibrinogen concentrate include the lack of significant amounts of other clotting factors, especially factors VIII, XIII and vWF. Cryoprecipitate may have an important role here whilst providing 8.2g/L fibrinogen.<sup>4</sup> Early administration of TXA was crucial. TXA binds exposed lysine sites, hindering plasmin spread and fibrin mesh breakdown. There is no evidence for repeated dosing of TXA, but it may be consumed more rapidly in systemic hyperfibrinolysis and persisting haemorrhage. The value of the OBS Cymru algorithm with ROTEM guided resuscitation cannot be understated in this case. It proved easy to follow, prompting rapid decision making of the blood product replacement to facilitate haemostasis.

## Learning points

- Placental abruption can result in profound obstetric coagulopathy.
- Early ROTEM can facilitate diagnosis and management.
- Large quantities of fibrinogen may be required to correct coagulopathy.
- Use of fibrinogen concentrate helps to mitigate the risk of volume overload.
- Fibrinogen concentrate availability may be limited by hospital stock.
- Early consultation with haematology is recommended.

## References

1. Marinho D. Perioperative hyperfibrinolysis - physiology and pathophysiology. Braz J Anesthesiol. 2021 Jan-Feb;71(1):65-75.

2. Collins PW, Bell SF, De Lloyd L, Collis RE. Management of postpartum haemorrhage: from research into practice, a narrative review of the literature and the Cardiff experience. International journal of obstetric anaesthesia. 2019 Feb 1;37:106-17.

3. Charbit B, Mandelbrot L, Samain E, Baron G, Haddaoui B, Keita H, *et al*. The decrease of fibrinogen is an early predictor of the severity of postpartum hemorrhage. Journal of Thrombosis and Haemostasis. 2007; 5(2):266-273.

4. Norfolk D. Handbook of transfusion medicine. Norwich, UK: TSO; 2014.

5. McNamara H, Mallalah S, Barclay P, Chevannes C, Bhalla A. Coagulopathy and placental abruption: changing management with ROTEM-guided fibrinogen concentrate therapy. Int J Obstet Anesth. 2015 May;24(2):174-9.