

# A Planned Caeserean Birth in a Patient with Congenital Analbuminaemia

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## What is congenital analbumnaemia (CA)?

- Rare inherited autosomal recessive disease, prevalence of <1 in 1 000 000
- Characterised by absence or very low levels of human serum albumin.
- Diagnosis is confirmed via plasma protein electrophoresis or mutations in the gene encoding albumin.

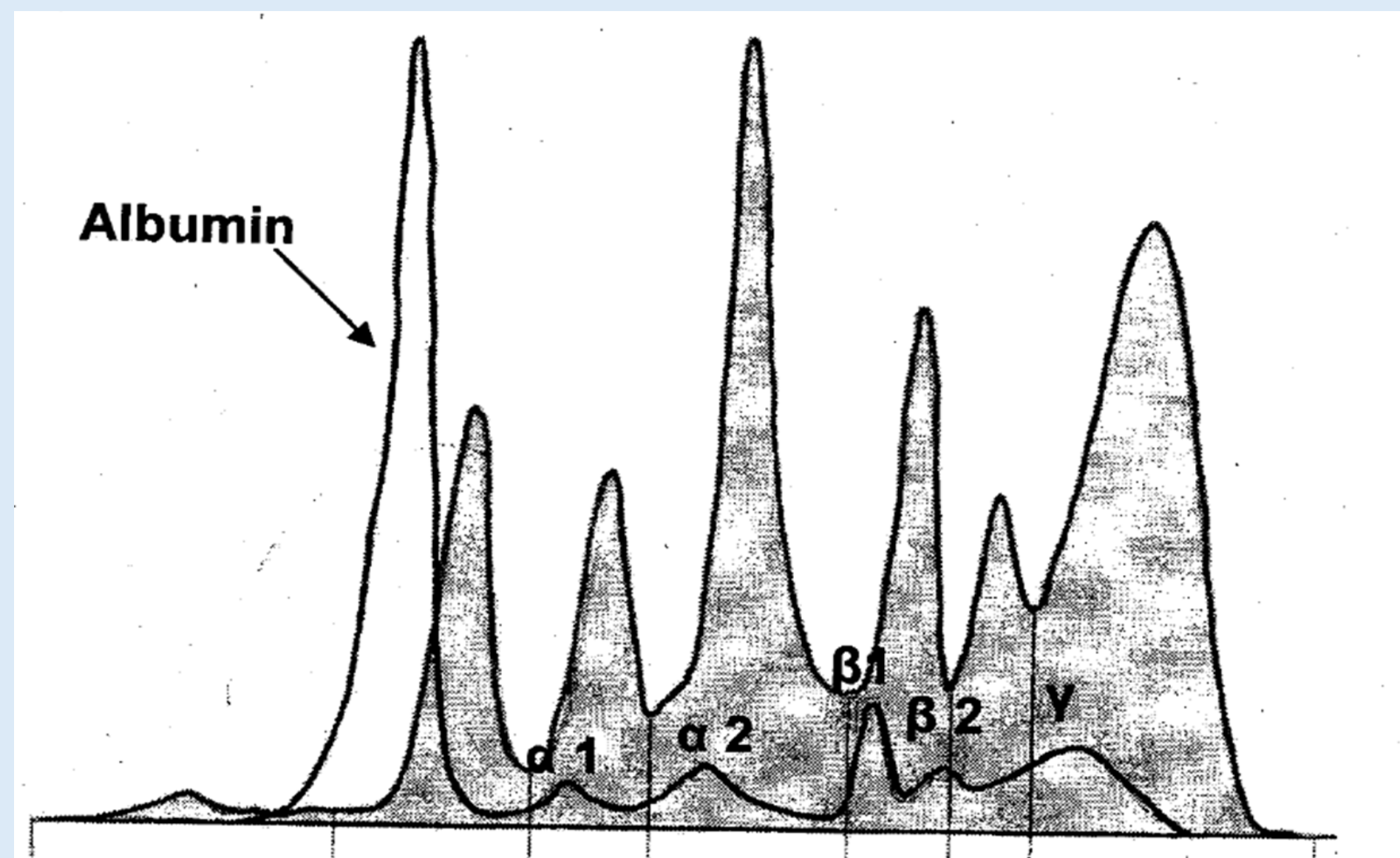


Figure 1 – Patients serum plasma electrophoresis result, shaded area indicates patient result, clear area indicates control.  $\alpha$  1 = Alpha 1 globulins etc. Rightward shift of patient's electrophoresis result demonstrated due to abnormal protein production.

## What role does albumin have in health?

- Main component of circulating plasma proteins, constituting at least 50% of the total protein present in blood<sup>1</sup>.
- Acts as a carrier protein, not only for drugs but also endogenous ligands such as bilirubin and fatty acids.
- Major role in maintaining plasma oncotic pressure.
- The body can compensate for a lack of albumin by producing other proteins e.g. coagulation factors.

### References

1. Koot, Bart GP, et al. "Congenital analbuminaemia: biochemical and clinical implications. A case report and literature review." *European journal of pediatrics* 163 (2004): 664-670..
2. Galliano, Monica, et al. "Molecular diagnosis of analbuminemia: a novel mutation identified in two Amerindian and two Turkish families." *Clinical chemistry* 48.6 (2002): 844-849.
3. Frohlich, J., et al. "Further studies on plasma proteins, lipids, and dye-and drug-binding in a child with analbuminemia." *Clinical chemistry* 27.7 (1981): 1213-1216.
4. Hu, Hillary, et al. "Pregnancy in a patient with congenital analbuminaemia." *Case Reports* 2017 (2017): bcr2016218093.

## Section of normal albumin gene

Ala Lys Thr Cys Val Ala Asp Glu  
GCA AAA **ACA** TGT GTT GCT GAT GAG

Frameshift Deletion

## Most common mutation of the albumin gene (Kayseri)

Ala Lys Thr Cys Cys **Stop Stop**  
GCA AAA ACG TGT TGC TGA TGA

Figure 2 – Genetic basis of the disease. Each letter indicates one of 4 bases ATCG. 3 bases code individual amino acids. Frameshift deletion (indicated by bold, underlined bases) causes abnormal truncated albumin to be produced<sup>2</sup>.

## What are they symptoms of CA?

- Oedema and hypotension due to changes in plasma oncotic pressure.
- Hypercoagulability and hypercholesterolaemia due to changes in protein balance and type.
- Increased rates of premature birth and miscarriage in pregnancy.

## What are the management options in CA?

- There is no definitive management for the disease.
- Complications can be minimised with statins and anticoagulants.
- Albumin infusions have been given in acute settings but no benefits in the longer term.

## Pharmacological Effects of CA

- Albumin is an anion and predominantly binds proton donors e.g. acidic drugs.
- Highly protein bound drugs that are also acidic will be present in the unbound state in significantly increased proportions.
- Most drugs must be unbound to have a pharmacological effect.
- Drugs like warfarin and diazepam have 10 x the proportion of the drug in an unbound state In CA compared to healthy controls<sup>3</sup>.

| Drug               | Protein Binding | Acid/Base     |
|--------------------|-----------------|---------------|
| Lidocaine          | 70%             | Basic         |
| Levobupivacaine    | 95%             | Basic         |
| Morphine           | 35%             | Basic         |
| Paracetamol        | 20%             | Unionised     |
| <b>NSAIDs</b>      | <b>&gt;90%</b>  | <b>Acidic</b> |
| <b>Ondansetron</b> | <b>76%</b>      | <b>Acidic</b> |
| <b>Enoxaparin</b>  | <b>80%</b>      | <b>Acidic</b> |
| Co-amoxiclav       | 18-25%          | Acidic        |
| Labetalol          | 50%             | Basic         |
| Oxytocin           | Very Low        | -             |
| Ergometrine        | Unknown         | Basic         |

Figure 3 – Comparison of commonly used drugs in obstetric anaesthesia, highest risk medications marked as bold<sup>4</sup>.

## Anaesthetic Issues Identified

- Very little literature evidence available about CA, no evidence of its impact on anaesthesia
- Potential haemodynamic changes related to fluid shifts
- Altered drug metabolism and unpredictable drug effects

## Patient at time of Planned Caeserean Birth

- 23 years old, 36 + 6 weeks, para 0 + 4, CA diagnosis.
- Currently prescribed aspirin and prophylactic enoxaparin (last dose 36 hours ago).
- BMI 19, Weight 64 kg
- Symptomatic from CA:
  - Significant lower limb oedema + lipodystrophy
  - Chronic fatigue and dizziness
- Plan for planned caesarean birth at 37 weeks from obstetric team.

## Perioperative Course

- Haematology contacted for advice,, anti Xa Levels normal
- Spinal performed and medications administered as routine, NSAIDs avoided.
- Patient stable throughout case, 300ml EBL, 32-minute operative time.
- Neonatal admission to NICU.
- LMWH heparin prescribed postoperatively..
- Pelvic haematoma developed and was successfully managed conservatively.
- Patient doing well at latest follow up.

## Conclusion

- CA an incredibly rare genetic condition with significant impacts on pregnancy
- No previous reports of caesarean births in the literature
- Standard anaesthetic technique for caesarean birth in this case had no complications
- However, post operative pelvic haematoma occurred.
- Hypothesise that higher than normal unbound concentration of enoxaparin contributed to haematoma formation