

Case study and discussion: Sugammadex in pregnant patients undergoing non-obstetric surgery and non-pregnant patients taking hormonal contraceptives

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Background

Sugammadex is a modified gamma-cyclodextrin used to reverse neuromuscular blockade caused by rocuronium. It binds, encapsulates, and deactivates rocuronium to achieve this effect and is later renally excreted. The molecular structure of rocuronium and progesterone are similar enough that pharmacokinetic modelling suggests sugammadex will also bind, encapsulate and deactivate progesterone, resulting in a drop in plasma concentration of approximately 34%[1].

A decrease in serum progesterone can lead to failure of hormonal contraceptives, along with pre-term labour / miscarriage [2].

Evidence is poor and in-vivo studies are limited, with one performed on males [3] and the other on non-pregnant women, but suggest that post-sugammadex administration there is an initial increase in progesterone from baseline, followed by a decrease below baseline [4].

Further research is limited by the obvious ethical issues surrounding recruitment to a trial where the intervention may result in unintended pregnancy or significant harm to an existing foetus.

Case study

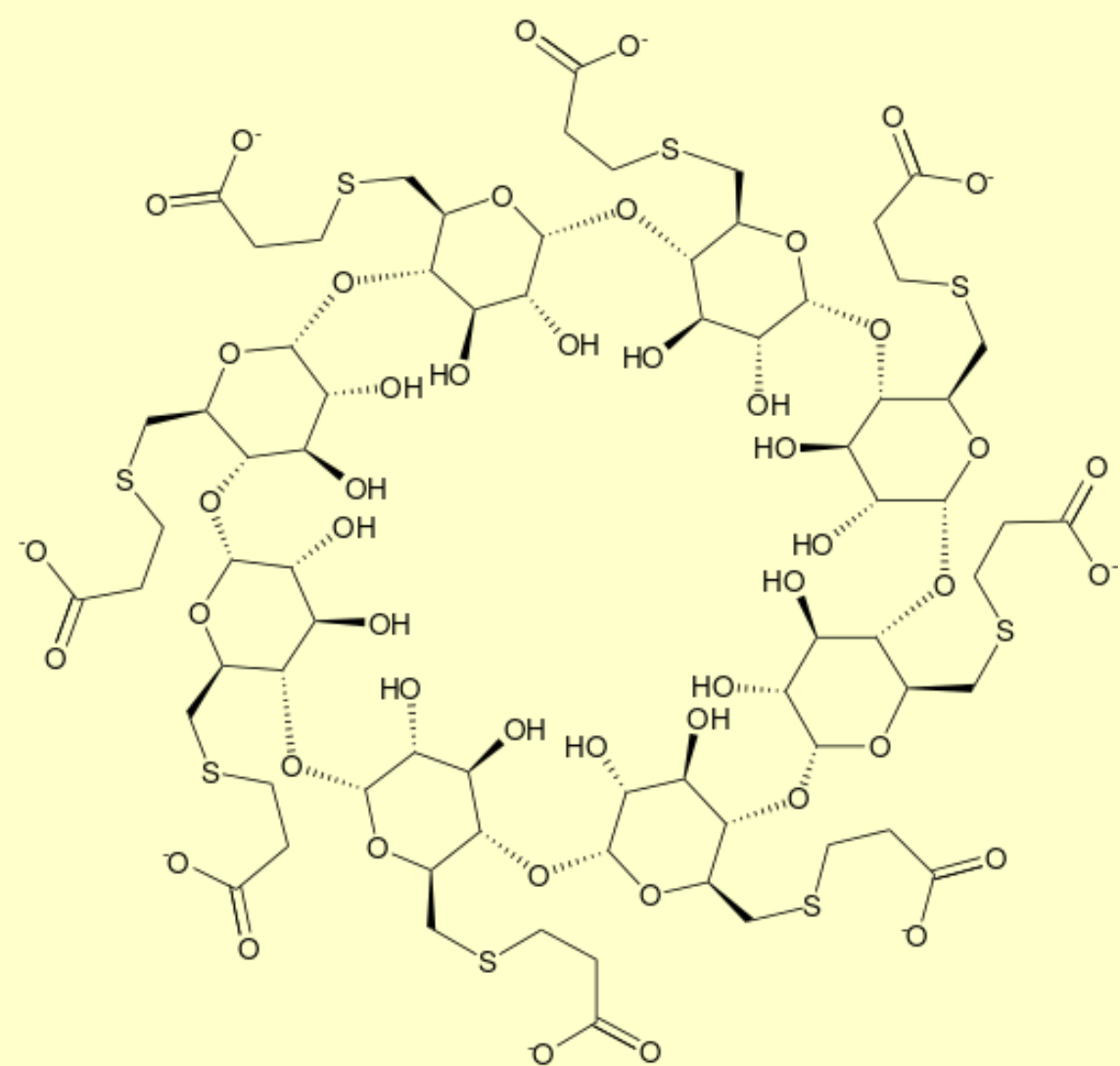
A 30-week pregnant female presented with a dental abscess refractory to antibiotics and was unable to tolerate incision and drainage under local anaesthesia. The case underwent MDT discussion (maxillofacial, anaesthetic and obstetric teams) and it was agreed that she should undergo a general anaesthetic (GA) but that to minimise risks to the foetus, time under GA should be as short as possible and she should have cardiotocography (CTG) monitoring immediately before and after GA.

CTG monitoring performed before induction was normal. Due to her gestation and consequently her risk of aspiration, a rapid sequence induction (RSI) was performed. Surgeons estimated operative time to be around 60 minutes and she was induced with 1mg/kg rocuronium, 1mcg/kg fentanyl and 2-3mg/kg propofol. Intubation was uneventful. Anaesthesia was maintained with sevoflurane.

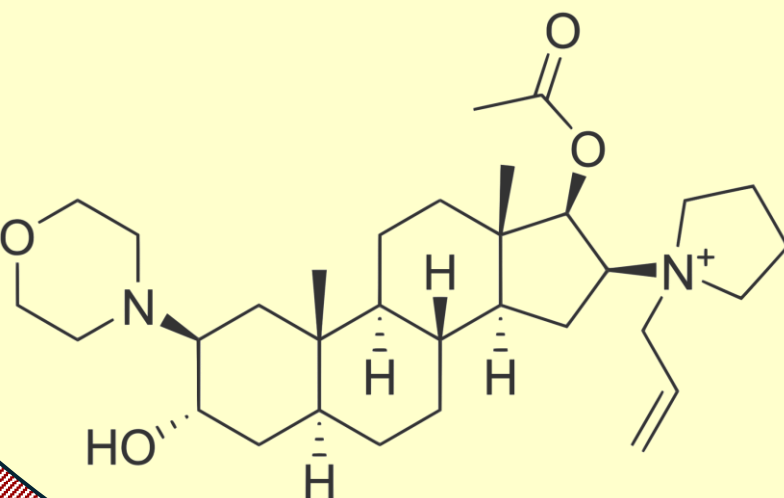
Surgery finished earlier than expected after around 15 minutes; following discussion, a decision was made to titrate sugammadex to response using train of four (TOF) monitoring. Sugammadex was administered in 25mg boluses and after 75mg (and 40 minutes from administration of rocuronium) it was noted the patient had a TOF of 4/4 with no fade and was breathing spontaneously with good tidal volumes and minimal support. The patient emerged from anaesthesia and extubation was uneventful.

Shortly after arrival in recovery she was assessed by midwives and a CTG was performed. They noted she had some uterine tightening and episodes of foetal decelerations which subsequently settled. The rest of her pregnancy and birth were without significant complication.

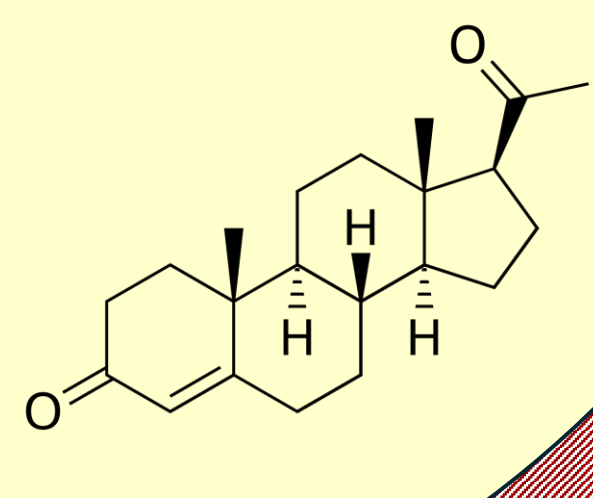
Sugammadex



Rocuronium



Progesterone



Discussion: pregnant patients undergoing non-obstetric surgeries

The main choice faced by the anaesthetic team was whether to:

- Reduce length of GA (and associated risks for foetus) by reversing with 2-4mg/kg sugammadex (theoretical risk of pre-term labour)
- Increase length of GA (and associated risks for foetus) by waiting for neuromuscular blockade to ease to a point where glycopyrronium and neostigmine could be given for reversal

Following discussion, further options were proposed:

- Start CTG monitoring whilst maintaining GA and aim for reversal with glycopyrronium and neostigmine. Reverse with sugammadex if CTG suggests foetal compromise
- Titrate sugammadex to response, minimising theoretical risk of preterm labour whilst also reducing length of GA
 - It should be noted that this may increase the risk of residual neuromuscular block and that even with a TOF ratio = 1.0, the majority of postsynaptic receptors may still be occupied by the neuromuscular blocking drug [5].
 - Co-administration of neostigmine / glycopyrronium may help to reduce the risk of residual neuromuscular blockade in this instance. Some small studies have shown that administration of sugammadex 1mg/kg + neostigmine 50mcg/kg + glycopyrronium 10mcg/kg to be as effective as sugammadex 2mg/kg [6].

Consider relative benefits of using rocuronium vs alternative neuromuscular blocking drugs suitable for use in an RSI e.g. suxamethonium

Discussion: patients of childbearing potential undergoing surgery

Administration of sugammadex can lead to a reduction in serum progesterone levels, risking failure of hormonal contraceptives. In fact, the manufacturer of sugammadex recommends that if administered to a patient using hormonal contraception, an additional form of non-hormonal contraception should be used for the next 7 days due to the risk of contraceptive failure [7].

If we administer sugammadex to patients of child-bearing potential, should we inform them of the risk of hormonal contraception failure and counsel them on the use of non-hormonal contraception?

Do we do it well? If not, how could we do it better? Are there any mechanisms we could use to improve this?

Since sperm can live in the female reproductive tract for several days, fertilisation may occur several days after intercourse [8]. A patient taking a hormonal contraceptive who receives sugammadex may therefore be at risk of contraceptive failure and pregnancy even if they are counselled post-operatively on the use of a non-hormonal contraceptive method.

As best practice, should we therefore be consenting patients *before* administering sugammadex?

References

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