

RANITIDINE AND SODIUM CITRATE AS PROPHYLAXIS AGAINST ACID ASPIRATION SYNDROME IN OBSTETRIC PATIENTS UNDERGOING CAESAREAN SECTION

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ABSTRACT

The efficacy of a single oral dose of 0.3M of sodium citrate alone as a prophylaxis against acid aspiration syndrome in obstetric patients undergoing LSCS (elective and emergency) was compared with that of intravenous ranitidine. One group of patients was given 30ml of 0.3M sodium citrate orally just before the induction of anaesthesia while the other group was given 50mg of ranitidine intravenously together with the 30ml of 0.3M sodium citrate. This was done for both the elective and the emergency groups of patients. There was no significant difference in the mean pH of the gastric aspirate obtained from those given sodium citrate alone and those given sodium citrate and ranitidine in either the elective or the emergency group. However, in the emergency group, those who were given sodium citrate alone tend to have a larger volume of gastric aspiration when compared with those given ranitidine together with the sodium citrate. There were significantly more patients with gastric aspirates of more than 25ml in the emergency group to which sodium citrate alone was given. It would appear that supplementing an intravenous dose of ranitidine with the oral dose of sodium citrate is useful in emergency LSCS as a prophylaxis against acid aspiration syndrome.

Keywords: Caesarean section, acid aspiration syndrome, gastric pH and volume, sodium citrate, ranitidine.

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INTRODUCTION

Pulmonary aspiration of gastric content (Mendelson's syndrome) in obstetric patients continues to be one of the commonest causes of maternal morbidity and mortality⁽¹⁾. A gastric pH of 2.5 or less and a gastric volume of 25ml and above are often used to define patients at risk of severe pulmonary damage should aspiration occur.

In the Maternity Hospital Kuala Lumpur, 30ml of 0.3M sodium citrate has been used since 1985 to neutralize the gastric content of all patients requiring caesarean section (LSCS)⁽¹⁾. A preliminary study done by the authors⁽²⁾ to evaluate the efficacy of sodium citrate in neutralizing the gastric content of this group of patients, showed that sodium citrate was effective in raising the gastric pH above 2.5 in both elective and emergency LSCS patients, but it was associated with a gastric volume of greater than 25ml especially in the emergency group. H₂ - receptor antagonist like ranitidine has been shown to increase the gastric pH and at the same time decrease gastric juice production⁽³⁾. Therefore it may be useful in neutralizing the gastric content of obstetric patients, especially in those presenting for emergency LSCS.

This study was designed to compare the efficacy of sodium citrate with that of ranitidine with regards to their effects on gastric pH and gastric volume of patients undergoing elective and emergency LSCS. We chose to give the ranitidine intravenously instead of orally, together with a dose of sodium

citrate because of the availability of only one operation theatre for LSCS, resulting in cases not being done at their scheduled time, thus making the timing of oral ranitidine administration very difficult to control. All patients who are in labour are not given any antacid or H₂ - receptor antagonist, thus when a decision is made for LSCS, there is very little time to fully prepare such patients. In view of these, we resorted to using intravenous ranitidine 30 minutes before induction and supplement with 30ml of 0.3M sodium citrate to neutralize the gastric content already present.

MATERIALS AND METHOD

Four groups of obstetric patients who underwent LSCS were studied. Group I consisted of 20 patients who underwent elective LSCS and were given 30ml of 0.3M sodium citrate orally just before induction of anaesthesia. Group II also had 20 patients who underwent elective LSCS but were given 50mg ranitidine intravenously supplemented with 30ml of 0.3M sodium citrate just before induction. Those in Group III underwent emergency LSCS and they were given only 30ml of 0.3M sodium citrate orally while those in Group IV also underwent emergency LSCS but received 50mg ranitidine intravenously in addition to 30ml of 0.3M sodium citrate.

All patients had a rapid sequence induction with pre-oxygenation, thiopentone, cricoid pressure, suxamethonium, and intubation. Anaesthesia was maintained with 50% nitrous oxide in oxygen. 0.5% halothane and a non-depolarising muscle relaxant. After the delivery of the baby, pethidine 1mg/kg was given and anaesthesia maintained with 67% nitrous oxide in oxygen.

Following intubation, a Ryle's tube was passed into the stomach and gastric content aspirated. Attempts were made to empty the stomach as much as possible by repeated aspiration while adjusting the position of the Ryle's tube. Volume of the aspirate was measured and a sample sent for pH analysis. After completion of the surgery, just before extubation, the gastric content was again aspirated, its volume measured and a sample sent for pH analysis.

The pH of the gastric content was measured using a Corthening pH meter. Volume and pH data were compared using the Student's t test. The number of patients considered

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to be at risk of pulmonary aspiration in each group were compared using the Fisher Exact Test. A p value of less than 0.05 was considered as significant.

RESULTS

The patients' characteristics are summarized in Table I. There was no significant difference between the groups with regards to their age, weight and fasting interval.

Table I - Patients' Characteristics
Values expressed in mean(SD)

	Elective LSCS		Emergency LSCS	
	Group I (n=20)	Group II (n=20)	Group III (n=20)	Group IV (n=23)
Number	20	20	20	23
Age(years)	27.6 (5.5)	29.6(4.5)	28.3 (4.4)	30.7 (5.4)
Weight(Kg)	62.9(11.1)	65.6(8.0)	62.0(11.2)	63.9(11.3)
Fasting intervals(hrs)	10.2 (2.6)	10.9(3.3)	8.8 (4.6)	9.1 (5.7)

Table II shows the pH of the gastric aspirates obtained from the 4 groups of patients at induction and just before extubation. There was no significant difference in the mean pH of the gastric aspirate obtained from patients given sodium citrate alone and those given sodium citrate and ranitidine in either the elective or emergency group.

Table II - pH of gastric aspirate in elective and emergency LSCS patients

	Elective LSCS		Emergency LSCS	
	Group I (n=20)	Group II (n=20)	Group III (n=20)	Group IV (n=23)
Induction				
Mean(SD)	5.46(0.8)	5.31(1.35)	5.36(1.13)	5.32(1.26)
Range	4.10-7.08	1.85-6.56	2.65-6.53	1.88-6.78
Extubation				
Mean(SD)	5.58(0.8)	5.38(1.1)	5.22(1.17)	5.18(1.23)
Range	3.64-7.03	2.79-6.76	2.01-6.86	2.54-6.70

The volume of gastric aspirate for the 4 groups are shown in Table III. The volume of gastric aspirate in those given ranitidine together with sodium citrate (Group II) appeared to be smaller than those given sodium citrate alone (Group I) in the elective group. The difference is however not statistically significant. In the emergency group, patients who were given sodium citrate alone (Group III) had a significantly larger volume of gastric aspirate ($p < 0.05$ with Student's t test) at induction and just before extubation when compared with those who were given sodium citrate and ranitidine (Group IV).

Table IV shows the number of patients who were at risk ie pH less than 2.5 or gastric volume of more than 25ml. In the emergency group, there were significantly more patients having a gastric volume of more than 25ml who were given sodium citrate when compared with the group who were given sodium citrate and ranitidine ($p < 0.05$ using Fisher Exact test). Almost all patients (elective or emergency) whether they were given sodium citrate alone or sodium citrate and ranitidine had a gastric pH of more than 2.5.

DISCUSSION

Antacids like sodium citrate though effective in neutralizing the gastric content of obstetric patients presenting for LSCS, are often associated with an increase in the gastric volume. This is a disadvantage as the increased gastric volume will

Table III - Volume of gastric aspirate in elective and emergency LSCS patients

	Elective LSCS		Emergency LSCS	
	Group I (n=20)	Group II (n=20)	Group III (n=20)	Group IV (n=23)
Induction				
Mean(SD)	21.3(18.5)	12.2(16.5)	26.8(26.5)	*12.9(15.7)
Range(ml)	1-65	1-60	12-126	2-64
Extubation				
Mean(SD)	10.2(6.1)	7.9(8.1)	16.2(13.2)	*7.4(5.8)
Range(ml)	3-32	2-32	2-47	1-60
Total volume				
Mean(SD)	31.5(18.5)	20.1(18.0)	43.0(28.4)	*20.3(17.8)
Range(ml)	5-71	3-65	13-130	3-74

* significant between Group III and Group IV at $p < 0.05$ using Student's t test

Table IV - No. of patients "at risk" (pH < 2.5 and volume > 25ml)

	Elective LSCS		Emergency LSCS	
	Group I (n=20)	Group II (n=20)	Group III (n=20)	Group IV (n=23)
Induction				
pH < 2.5	0	2(10%)	0	1(4.3%)
Vol > 25ml	6(30%)	3(15%)	9(45%)	*3(13%)
Extubation				
pH < 2.5	0	0	1(5%)	0
Vol. 25ml	0	2(10%)	6(30%)	*1(4.3%)

* significant when compared with Group III ($p < 0.05$) using Fisher Exact test

expose the patients to the risk of gastric aspiration into the lungs.

In this present study, we found that 30ml of 0.3M sodium citrate when given orally just before the induction of anaesthesia, was just as effective as when ranitidine was given with it, in increasing the gastric pH and maintaining it above the critical level of 2.5, in both elective and emergency situations. In fact none of the patients given sodium citrate alone in either the elective or emergency group had a gastric pH of less than 2.5 during induction and just before extubation.

It was also observed that patients who were given sodium citrate alone had a larger volume of gastric aspirate than those who were given ranitidine and sodium citrate. This was statistically significant in the emergency situation where 45% of patients who were given sodium citrate had a gastric volume of more than 25ml at induction, compared with 13% in patients who were given ranitidine and sodium citrate. Just before extubation, 30% of the patients given sodium citrate had a gastric volume of more than 25ml compared with 4.3% in the group given ranitidine and sodium citrate. The ability of ranitidine to decrease gastric volume is in agreement with the findings of McAuley et al⁴⁹ where the mean gastric volume aspirate was significantly lower in LSCS patients who were given 150mg ranitidine orally pre-operatively than the control group receiving magnesium trisilicate. Maltby et al⁵⁰, in their study demonstrated that the mean gastric volume was significantly higher in patients who received sodium citrate than those who received ranitidine alone. This ability of ranitidine to decrease gastric volume is especially useful in emergency situa-

tion where gastric volume tends to be larger as a result of delayed gastric emptying which occurs during labour and which may be increased by any narcotic analgesic given for the labour pain.

We do recognise that our method of aspiration of gastric content does not ensure the complete retrieval of all the gastric content. This blind technique of aspiration tends to underestimate the actual gastric volume as shown by Taylor and Barry⁽⁶⁾. It is likely that volumes larger than what we have obtained were present. Dye dilution technique may be more accurate in measuring gastric volume but in this group of patients it may be hazardous to use this method.

Danmann and co-workers⁽³⁾ have shown that an intravenous bolus dose of 50mg of ranitidine would induce an increase in gastric pH within 30 minutes and a concomitant marked decrease of gastric volume. This rapid onset of action would allow a short time interval of administration of the drug and the induction of anaesthesia. This could be very useful in our patients who need emergency LSCS as they are not given any antacids or H₂ - receptor antagonist during labour. Thus when a decision is made for LSCS there is often little time to prepare the patients fully.

In addition, Bertaccini et al⁽⁷⁾ have shown that parenteral ranitidine increased the tone of lower oesophageal sphincter. This may be of further benefit in this group of patients in whom gastrooesophageal reflux occurs frequently.

In conclusion, our study has shown that the administration of a single dose of 30ml of 0.3M sodium citrate is effective in neutralizing the gastric pH in elective LSCS patients. Intravenous ranitidine supplemented with an oral dose of 30ml of 0.3M sodium citrate was found to significantly reduce the gas-

tric volume of patients coming for emergency LSCS. The use of intravenous ranitidine in addition to an oral dose of sodium citrate may therefore be useful in patients coming for emergency LSCS as a prophylaxis against acid aspiration syndrome. Finally, it must be emphasised that, no technique completely eliminates the threat of aspiration. All measures to prevent regurgitation and aspiration of stomach content into the lungs must be employed as rigorously as ever.

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