A CLINICAL STUDY OF VOLUME AND pH OF GASTRIC CONTENTS IN GRAVID AND NON-GRAVID PATIENTS

by

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Introduction

There is always a potential danger of aspiration of gastric contents into the respiratory passages specially in emergency obstetrical procedures and induction of labour (Taylor and Pryse-Davies 1966: McCormick *et al* 1966; Adams *et al* 1969). Aspiration of gastric contents is the most common cause of maternal anaesthetic death (Robert and Shirley 1974, 1976). The mortality and morbidity depends on the pH of the gastric contents (Teabeaut 1952, Robert and Shirley 1974, 1976). Besides taking measures against aspiration it would be safest approach to identify high-risk patients.

Material and Methods

The present study was conducted on 60 patients in the child bearing age, 18 to 40 years, to evaluate the acidity and volume of gastric contents in gravid and non-gravid cases in order to determine their risk of developing Mendelson's syndrome.

All patients were clinically assessed on pre-anaesthetic visit for their physical fitness. Patients with gastric, hepatic renal and cardio-respiratory problems were excluded. The cases were divided into the following two groups of 30 in each.

Group I: (Non-gravid) operated for surgical problems. Subdivision according to premedications:

(i) No premedication—10 cases.

(ii) atropine 0.65 mg—pethidine 50 mg I.M. ½ hr. before operation—10 cases.

(iii) pethidine 50 mg I.M. ½ hr. before operation—10 cases

Group II: (Gravid) operated for emergency caesarean section.

(i) No premedication—10 cases.

(ii) atropine 0.65 mg—pethidine 50 mg I.M. ½ hr. before operation—10 cases.

(iii) pethidine 50 mg I.M. ½ hr. before operation—10 cases.

Technique of anaesthesia

After recording vital parameters and setting an intravenous infusion of 5% G.D.W., induction with a sleeping dose of thiopental 2.5% (varying 250-300 mg) followed by succinylcholine (1 mg/kg) and intubation with an appropriate cuffed tube was done. Anaesthesia was maintained with nitrous oxide (5 L/min.) oxygen (2.5 L/min.) and d-tubocurarine.

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Gastric samples were collected by a nasogastric tube (i) just after intubation, (ii) just before extubation. Then both the samples were mixed and total volume and pH were determined by pH colerometer (Backman glass electro pH meter).

Results

Volume changes of gastric contents are shown in Table 1. The volume of the contents was large in gravid patients (G.P.) than non-gravid patients (N.G.P.).

It was found that shorter the duration of anaesthesia the larger was the volume of gastric contents. Majority of such cases having large volume were from the gravid group who underwent emergency obstetrical surgery.

The pH value 2.5 or below was more in G.P. than N.G.P. It was in 10 cases (100%) in no-premedication, 7 cases (70%) in atropine-pethidine and in 9 cases (90%) in pethidine groups in G.P., whereas that was in 6 cases (60%), 5 cases (50%) and 6 cases (60%) in N.G.P. with respective premedications.

The overall incidence of potential risk of aspiration in relation to pH and pregnancy is shown in Table II.

Table III shows the pH changes in G.P. and N.G.P. with different premedications.

It was found statistically that in no premedication G.P. are at higher risk ($t=2.9$, $P<0.01$) than N.G.P. and the same risk was found when only pethidine is given ($t=3.5$, $P<0.01$). In atropine-pethidine group, though the mean pH value was near 2.5 in both G.P. and N.G.P. but statistically it is difficult to

TABLE I

Volume Changes of Gastric Contents in Relation to Premedications

Volume		No premedication		Atropine-Pethidine		Pethidine	
		N.G.P.	G.P.	N.G.P.	G.P.	N.G.P.	G.P.
Range	(ml)	5.0-24.0	5.0-47.0	9.0-13.0	5.0-40.0	7.0-19.0	36.0-46.0
Mean	(ml)	16.2	37.4	11.9	32.9	15.0	42.6

TABLE II

Distribution in Relation to pH Value 2.5

	pH more than 2.5	pH below 2.5
Non-gravid	13 (43.33%)	17 (56.67%)
Gravid	4 (13.33%)	26 (86.67%)
Statistical value: $X^2 = 6.71$.		$P < 0.01$.

TABLE III

pH Changes in Gravid and Non-gravid Cases With Different Premedications

	pH	No premedication	Atropine-pethidine	Pethidine
Non gravid	R	1.0-4.0	1.9-5.0	2.0-3.8
	M	2.41	2.67	2.57
	SD	0.65	0.98	0.54
Gravid	R	1.6-2.4	1.6-3.4	1.6-2.8
	M	1.8	2.4	1.9
	SD	0.25	0.15	0.11

R = Range, M = Mean, SD = Standard Deviation.

say which patients are at more risk ($t=1.1$, $P>0.2$). Atropine premedication slightly affected the pH in N.G.P. but there is highly significant effect in G.P. as the mean pH increased from 1.8 to 2.4 having a high significant statistical value ($t=4.3$, $P<0.001$).

Discussion

Preoperative fasting is usually effective for preparing patients for elective surgery but patients requiring emergency surgical procedures present a problem. In fact stomach is never truly empty since normal secretions are continuously produced. It has been recognised that gastric emptying time in obstetrical patients may be delayed for 24 to 48 hours after intake (Robert and Shirley, 1974 Sharp, 1975). Taylor and Pryse-Davies (1966) demonstrated that 55% of the intrapartum patients had more than 40 ml of liquid gastric juice who underwent an emergency procedures and only 10% had a volume over 40 ml in elective obstetrical patients. In the present study the same was noted. In cases of gravid group subjected to emergency obstetrical procedure, 77.66% cases had more than 40 ml while none of the cases in N.G.P. had a volume over 25 ml thus suggesting that pregnancy definitely affects the gastric emptying.

Atropine premedication decreased the volume of gastric contents. In non-atropinised cases, 40% had more than 40 ml of gastric juice, thereby confirming the findings of other authors (Bootright *et al*, 1970; Salem *et al*, 1976).

Duration of anaesthesia affected the volume of gastric contents. Shorter the duration more the volume. Unfortunately, others have not stated the relationship between the duration of anaesthesia and volume of gastric contents.

The damaging effects of the contents much depend upon its pH (Teabeaut, 1952). As the pH of the aspirate decreases the pulmonary parenchymal damaging effects increases. The patients most at risk would be one who had gastric content volume of 25 ml or more with a pH below 2.5 (Teabeaut, 1952; Pryse-Davies, 1966; Taylor and Pryse-Davies, 1968). The present study revealed that in N.G.P. 56.67% were having pH below 2.5 whereas in G.P. 86.67% had a pH below 2.5 thus indicating with a statistical significance ($P < 0.01$) that pregnancy is a high risk factor in aspiration syndrome.

Atropine premedication also affected the pH in both G.P. and N.G.P. but there was highly significant increase in pH of gastric contents in pregnant women than nonpregnant ($P < 0.001$). Pregnant cases without premedication are at higher risk than non-pregnant ($P < 0.01$).

In conclusion, pregnancy definitely affects the volume and acidity of the gastric contents. This, therefore, proves that pregnancy is a high-risk factor, therefore all preventive measures against aspiration syndrome must be started at the onset of labour even in normal delivery cases. Atropine premedication must be given intravenously just before induction of anaesthesia. In cases requiring anaesthesia for short obstetrical procedures one must be more cautious to prevent aspiration.

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