Section: Anaesthesiology

Original Research Article

A PROSPECTIVE CASE CONTROL STUDY TO ANALYSE THE GASTRIC VOLUME AND CROSS SECTIONAL AREA OF ANTRUM USING POINT OF CARE GASTRIC ULTRASONOGRAPHY AMONG TYPE 2 DIABETIC AND NON DIABETIC PATIENTS

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Abstract

Background: The most significant risk factor for perioperative pulmonary aspiration is delayed gastric emptying and the ensuing "full stomach". By using point-of-care gastric sonography, we sought to compare the gastric volume of patients with type 2 diabetes and those without the disease who were scheduled for elective surgery. **Materials and Methods:** 50 patients from type 2 diabetic group and 50 patients from non-diabetic group undergoing elective surgery were included. Prior to the administration of anesthesia, a gastric ultrasound was conducted both in the supine and right lateral decubitus positions. Gastric volume and cross-sectional area were computed using the anteroposterior and craniocaudal diameters of the gastric antrum. **Result:** The cross sectional area in the right lateral decubitus position (RLD) was 2.37±0.98 (P value - 0.00042; <0.05-significant) and 3.35±0.83 (mean±SD) in non-diabetic patients and diabetic patients, respectively. The mean±SD value for stomach volume was 9.104±17.83 with a P value of 0.042 (less than 0.05-significant) and 14.34±11.32 in diabetes patients. **Conclusion:** Following the current preoperative fasting guideline, nearly half of type 2 diabetic patients exhibited higher gastric volume and cross sectional area than non-diabetic individuals.

INTRODUCTION

A major complication that has a high rate of morbidity and mortality during the perioperative phase is aspiration of stomach contents.[1] Mendelson was the first to report aspiration of stomach contents with lethal consequences, which had a tremendous impact on the development of anaesthesiology. Aspiration of gastric contents has been estimated to occur once every 2000–3000 surgeries; individuals who are pregnant, obese, chronic liver or kidney disease, diabetes mellitus (DM), neuromuscular disease, scheduled for emergency procedures are at higher risk.

Diabetic patients are thought to have a significant risk of delayed gastric emptying.

Autonomic neuropathy in diabetic patients is known to produce gastroparesis, which prolongs the time it takes for the stomach to empty, increasing the risk of aspiration compared to healthy individuals.[2]

It has been demonstrated that widely accessible ultrasound is a trustworthy bedside method for determining residual gastric volume.[4-8] Since diabetic patients often have an inadequate empty stomach even after an appropriate fast, ultrasonography can be used to examine the fasting gastric volume of these patients before induction to see if it exceeds the recommended safe limit. In the current study, ultrasonography was used to assess the fasting gastric volume of patients with diabetes and those without diabetes who were scheduled for elective surgery

MATERIALS AND METHODS

50 diabetic and 50 non diabetic patients were enrolled in this study with written informed consent after receiving approval from the Institutional Ethical Committee.

Criteria for Inclusion

• ASA grade 1-3;

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• Patients of both sexes;
• Age>18 years
• Patients with type 2 Diabetes Mellitus,
• Non diabetic patients
• Patients posted for elective surgery.

Criteria for Exclusion

Patients who suffer from chronic kidney disease, hyperthyroidism, connective tissue diseases that impair GIT motility,

Smoking, history, antidepressant use, history of oesophageal or abdominal surgery, obesity,

pregnancy.

The duration of the fasting interval was noted. An ultrasound trained individual who was blind to the patient's diabetes condition conducted an ultrasound using a sonosite edge 2 machine with a low-frequency (2–5 MHz, 60 mm) transducer probe with a scan depth of up to 30 in the curvilinear array. Patients were scanned in two positions: supine (laying flat on their back) and right lateral decubitus (RLD). At the level of the aorta, or inferior vena cava, the gastric antrum was found in a sagittal to right parasagittal plane between the left lobe of the liver and the pancreas [Figure 1]. To obtain an appropriate transverse view of the antrum and to avoid oblique pictures that would have overestimated the antrum's cross-sectional area (Right lateral CSA) and ultimately gastric volume, the probe was tilted as necessary.

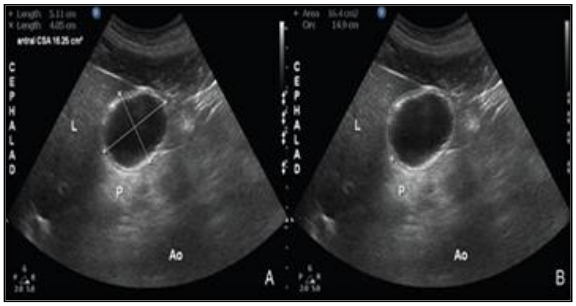

Figure 1

Using the area formula, the cross-sectional area (CSA) was computed using the anteroposterior (AP) and craniocaudal (CC) diameters.

$(AP \times CC \times \pi)/4 = CSA$.[9]

For the right lateral position, the stomach residual volume (mL) was determined using the previously verified Perlas and colleagues equation[3]: 27.0 + 14.6 × right-lateral CSA – 1.28 × age.[11]

Statistical Analysis

SPSS (statistical package for social sciences) software version 22 was used to analyze the data .Continuous variables such as age, height, weight, and BMI of both groups were compared using the mean and standard deviation. CSA and gastric volumes were compared using the student t test and a probability value of <= 0.05 was considered significant.

RESULTS

The mean diameters measured in the supine and RLD postures in diabetic group had a higher value (P value = 0.001), which differed statistically significantly. Quantitative study revealed that diabetic patients had a higher residual gastric volume.

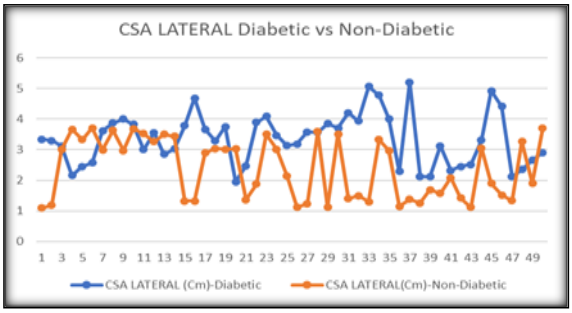

Figure 2

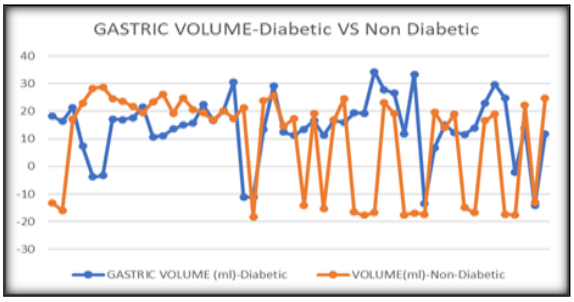

Figure 3

DISCUSSION

Diabetes is commonly thought of as a high-risk illness that poses numerous difficulties for anaesthesiologists. One of the most feared side effects of diabetes is pulmonary aspiration as individuals with the condition are believed to have a possible full stomach due to autonomic gastropathy,[12] According to Camilleri et al,[2] delayed gastric emptying was one of the major consequences of Diabetes Mellitus. In a retrospective cohort study with 538 patients, Putte et al,[23] discovered that even in healthy people, a conventional fasting interval does not guarantee sufficient emptying. They discovered that 32 individuals had fasting gastric volumes that exceeded the acceptable limit, changing the plan for inducing anaesthesia. Diabetes has long been associated with increased risk, but no real-time study has been conducted to precisely stratify the patient's fasting volume status and determine the patient's gastric volume using ultrasonography. With the advent of Enhanced Recovery after Surgery (ERAS) protocols and the liberalization of fasting guidelines, USG could be useful in our regular perioperative practice to assess the residual gastric volume in diabetes patients. This study compared the fasting gastric volume of patients with diabetes

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and those without diabetes who were posted for elective surgery.

Although gastroparesis has been associated with type 1 diabetes more frequently, it can also occur in type 2 diabetes, even in asymptomatic people. After eating a meal, 11 type 2 diabetic patients and 11 healthy volunteers were studied by Chiu et al,[17] to compare the stomach antral region in type 2 diabetic patients and healthy controls. They were all trans abdominally scanned for visual analogue scales and stomach motility. They discovered that diabetic patients had considerably delayed gastric emptying than controls and also had weaker antral contractions (46.3 min versus 20.8 min, respectively). Their study showed a similar result as the present study. In calculating gastric volume, negative values were obtained. This was observed in patients with a lower cross sectional area, which produced a negative score. Previous study with the formula derived by Perlas et al,[11] to measure Gastric volume also gave negative values as well. Therefore, the values of Right Lateral Decubitus Cross sectional Area (RLD CSA) generate a negative value when the stomach is empty, which solely denotes an empty state. There was a statistically significant difference between the mean diameters measured in the supine and RLD postures, with the diabetes group having a greater value (P value = 0.001). Diabetic patients found to have a higher residual gastric volume by quantitative analysis. This is in line with earlier research that suggested diabetic people had a delayed gastric emptying. These trials, however, were conducted after consuming a substantial meal or liquid in order to measure gastric emptying rather than fasting gastric residual volumes.

CONCLUSION

According to this prospective case-control study, which included 100 patients, delayed gastric emptying in diabetic patients is linked to greater gastric antral cross-sectional area and gastric volumes as determined by ultrasound as opposed to non-diabetic individuals. Although qualitative grading can be used for screening, the quantitative assessment provides a more precise estimate of gastric volume.

Limitations: The patients with Type 2 diabetes were only included in our study. The duration of diabetes was not considered. There were almost ten hours on average between meals. In everyday clinical practice, precisely controlling the period of fasting prior to surgery might be difficult. Studies on the relationship between surgery and gastric motility are still lacking. The quantitative study was conducted using a known reference standard. More study is required to properly stratify the fasting gastric volume in those with diabetes.

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