

The efficacy of chewing gum on postoperative ileus following cesarean section in Enugu, South East Nigeria: A randomized controlled clinical trial

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Abstract

Background: Postoperative ileus (POI) is a common complication following caesarean section. It impairs patients comfort; delays wound healing and prolong duration of hospital stay. Several methods have been used in the management of this condition with varying efficacy. Chewing gum postoperatively is a recent concept in the western world being advocated as a cost effective and comfortable management of POI.

Aim: The aim was to evaluate the efficacy of gum-chewing in reducing POI following caesarean section in Enugu.

Materials and Methods: One hundred and eighty women booked for elective caesarean section were randomized into gum-chewing group ($n = 90$) or control group ($n = 90$) The subjects chewed sugarless gum three times daily from 6 h postoperatively until the first passage of flatus. Each chewing session lasted 30 min. Elective caesarean section was carried out with a Pfannenstiel incision. Groups were compared primarily for time to first bowel sound, and first flatus. Secondary endpoints of comparison were time of operation to first defecation, and patient satisfaction concerning postoperative gum chewing. The Student's *t*-test and Pearson Chi-square test and multiple linear regression were used for statistical analysis.

Results: The groups were comparable in age, body mass index (BMI) and duration of surgery. The mean time to first bowel sounds (21.9 ± 8.0 vs. 26.1 ± 10.0), mean time to first flatus (24.8 ± 6.4 vs. 30.0 ± 10.0) and mean time to defecation (30.7 ± 5.9 vs. 40.0 ± 9.0) were significantly reduced in patients that chewed gum compared with controls. $P = 0.02$, 0.01 , and 0.01 , respectively. Patients were satisfied with gum chewing and no side-effect was recorded. Previous surgery and duration of surgery were predictors on duration of POI, while age, BMI and parity had no effect.

Conclusion: Gum-chewing has a beneficial effect on early return of bowel function following caesarean section and should be included in the postoperative management protocol.

Key words: Caesarean section, chewing gum, ileus

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Introduction

Cesarean section is a common obstetric surgery with minimal complication in recent times.^[1,2] However, in addition to elective pre-operative fasting, patients endure additional postoperative hunger due to delay in return of bowel function called ileus. Patients are allowed oral intake only after a return of bowel function as shown by

the passage of flatus, feces, or sounds heard by abdominal auscultations.^[3] Prolonged delay in initiating postoperative feeding leads to increased cell breakdown, decreased wound healing, and prolonged hospital stay.^[4] Any measure that will reduce the duration of postoperative ileus (POI) will

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not only reduce cost of patient care, but will also improve patient comfort and postoperative satisfaction.

Among measures that has been applied to achieve this include minimal handling of gut at surgery, passage of nasogastric tube and adequate hydration.^[5] Early ambulation and use of cyclooxygenase inhibitors have also been tried. Some of these have not shown any benefit and a search for a safe and reliable method is warranted.^[6] Chewing gum is a type of sham feeding that has been reported to simulates gut motility after open abdominal surgery such as liver resection, colorectal surgery, and after laparoscopic surgery.^[7,8] It is presumed to act by vagal (parasympathetic) stimulation of the gut.^[9] Most literatures on chewing gum has been on intra-abdominal surgeries involving gut handling in western countries.^[10] There are also studies did not find any significant improvement in postoperative ileus following chewing gum.^[11] These discrepant evidences leave uncertainty in the surgical field about the efficacy of chewing gum in reducing the duration of POI. Accordingly, this study has been designed to study the effect of chewing gum after caesarean section in African women in Enugu, Nigeria with a view to providing an inexpensive, well-tolerated, and widely available solution to ameliorate an old problem.

This study thus, aims to identify the effect of chewing gum on duration of POI following caesarean section in Enugu, Nigeria with a view of having a comfortable, cheap, physiological, and effective solution to an ever-present problem.

Materials and Methods

This was a prospective single-blind randomized control trial carried out at University of Nigeria Teaching Hospital, Enugu in collaboration with three adjoining satellite specialist obstetric hospitals. After obtaining institutional research and ethics approval, 200 pregnant women for elective caesarean sections were consecutively recruited into the study, which spanned February 2013–November 2013. Inclusion criteria included age between 18 and 35, primigravida, spinal anesthesia and no allergy to mint. Patients with loose teeth were excluded. The women were also excluded if they were on opioids, diabetic, had previous pelvic or abdominal surgeries or hypothyroid. The patients were also excluded if the surgery lasted more than 1 h. A written informed consent was obtained from all patients at which point the demographic data age, parity, height, and weight was collected.

All enrolled women were allocated using a computer-generated random sequence from a statistics program into gum-chewing (G group) and control (control group). The women were notified of their groups at the immediate postoperative period. The nature of the study did not allow blinding of the subjects after assignment of the intervention postoperatively. The aim of chewing gum was

not revealed to them. The researchers were blinded to the patients' group allocation. Patients and nursing staff were also educated to keep the group allocation secret from the researchers.

Commercially available sugar-free gum (Orbit, Wrigley Company, Poland) was used for this study. All the women received spinal anesthesia with 0.5% heavy bupivacaine at L3/L4 interspace without any opioid adjunct. The cesarean section was carried out by a consultant Obstetrician and Gynecologist using a Pfannenstiel incision on the abdomen and a transverse lower segment incision on the uterus.

Patients in the chewing gum group were given one stick of sugar-free chewing gum 3 times daily (in the morning, afternoon and in the evening) from the 1st post-operative day for 5 consecutive days with an instruction to chew for 30 min without swallowing the chewed gum. The gums were given to patients at a fixed interval to help monitor compliance. Patients assigned to the control group did not chew gum and standard postoperative care was provided. All patients were asked to notify the nursing staff at first passage of flatus.

A research assistant who was not aware of the gum prescription, and groups visited the patients regularly, every 1 h, and recorded the time of the first bowel sounds, passage of flatus, and defecation.

The collected data were tabulated for comparative analysis.

All patients were followed-up through discharge. At discharge, patients in the gum group were interviewed on their satisfaction with the technique to rate it using a visual analogue scale from 1 to 10. (1 = not satisfied, 10 = very satisfied).

Statistical analysis

Sample size was calculated based on a previous study.^[6] Mean time of passage of flatus was assumed to be 24 h and a mean difference of 6 h was assumed to be of clinical relevance. Therefore, the mean time interval to the passage of flatus after gum chewing was proposed to be 18 h in the intervention group. Assuming a common standard deviation of 12 h, the sample size was calculated to be 85 participants for each group applying $\alpha = 0.05$ and 90% power. Statistical analysis of the clinical trial was conducted using Prism 6 statistical software, (GraphPad Prism version 6.00 for Windows, GraphPad Software, La Jolla California USA, www.graphpad.com). The obtained data were tabulated in a data form and analyzed with Prism 6 software for statistical analysis (GraphPad Prism version 6.00 for Windows, GraphPad Software, La Jolla California USA, www.graphpad.com). Student's *t*-test was used for the comparison of continuous variables between the two groups. The Pearson Chi-square test was used to check for

differences between proportions and to analyze demographic variables. Multiple linear regression was carried out to predict the effects of age, body mass index (BMI), parity and previous surgery on POI. $P \leq 0.05$ was considered as statistically significant.

The study's primary end points were time to first regular postoperative borborygmus and time to the first passage of flatus. The time at the end of the operation was defined as the 0 h. Secondary end points were time of operation to first defecation, and patient satisfaction concerning postoperative gum chewing.

Continuous variables are summarized as mean (\pm standard deviation).

Results

Two hundred subjects were initially recruited for the study of which 20 dropped out because they disclosed their group to the researchers, surgery lasted more than 1 h, failed spinal anesthesia. All remaining 180 completed the study. [figure 1] The demographic data are presented in Table 1. The mean age was 25.0 ± 6.4 and 25.5 ± 6.0 in the G and control groups respectively. ($P = 0.10$) There was no statistically significant difference in their demographic variables.

Table 2 shows the data for return of bowel function between the two groups. The gum chewing group had a statistically significant earlier onset of bowel sounds than the control ($P = 0.02$). The first passage of flatus was also earlier as was the passage of stool ($P = 0.04$ and 0.035 respectively). On the visual analog scale, all gum-chewing subjects expressed satisfaction (> 5). When POI was predicted it was found that previous surgery, ($\beta = -0.55$, $P = 0.01$), and duration of surgery ($\beta = 0.41$, $P = 0.05$) were significant predictors. The overall model fit was $R^2 = 0.47$. Age, parity, and BMI did not seem to affect POI ($\beta = -0.02$, $P = 0.7$).

Discussion

This study found no statistically significant difference in demographic features such as age, BMI, and parity between the gum-chewing and control groups. The same observations were made by Abd-El-Maeboud *et al.*^[6] In order to standardize the study, only consultant gynecologists carried out all the caesarean sections using Pfannenstiel incision. This was important as the skill of the surgeon and degree of bowel handling may be sources of inter subject differences.

We also found very significant differences in the time to first bowel sound, passage of first flatus and feces between the two groups. Yaghmaei *et al.* had studied oral intake profiles at 2 and 8 h following cesarean section under spinal anesthesia

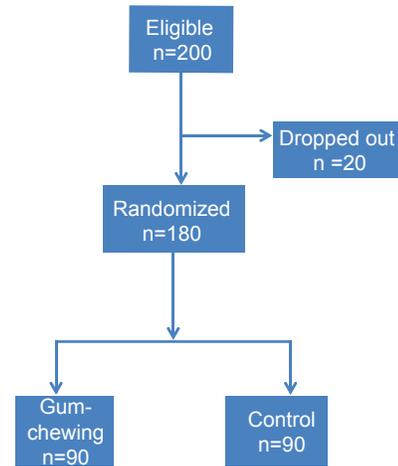


Figure 1: Flow chart of patients

Table 1: Demographic characteristics of subjects (n=180)

Variable	G group	Control	P value
Age	25.0 \pm 6.4	25.5 \pm 6.0	0.10
Parity	2.0 \pm 0.7	1.8 \pm 1.5	1.2
BMI	32.1 \pm 3.5	33.0 \pm 3.8	0.3
Duration of surgery	38.6 \pm 9	35.5 \pm 5.0	0.5
Previous surgery	1 \pm 2.0	1 \pm 1.5	0.7

BMI=Body mass index

Table 2: Return of Bowel function and recovery profile (n=180)

Variable	G group (mean \pm SD)	Control group (mean \pm SD)	P value
First bowel sounds (hours)	21.9 \pm 8.0	26.1 \pm 10.0	0.02
First flatus (hours)	24.8 \pm 6.4	30.0 \pm 10.0	0.01
First feces (hours)	30.7 \pm 5.9	40.0 \pm 9.0	0.01
Duration of stay	7.0 \pm 2.0	8.0 \pm 1.5	0.70
Satisfaction	8.5 \pm 1.0	6.5 \pm 1.0	0.05

SD=Standard deviation

and came to similar conclusions.^[12] In a meta-analysis of 17 randomized clinical trials by Li *et al.*, patients in the chewing gum treatment group, compared with the reference group, experienced a significant reduction of 0.31 days for time to first flatus, 0.51 days for time to first bowel movement, 0.72 days for length of hospital stay.^[13] Although the meta analysis involved heterogeneous group of surgeries, the conclusion was the same for effect of gum chewing on POI. Ngowe *et al.* in 2010 studied the effect of gum chewing on early passage of flatus following open appendectomy in 46 patients. The gum-chewing group passed flatus 18 h earlier.^[14]

In Egypt, Abd-El-Maeboud *et al.* in 2010 evaluated 200 patients after elective cesarean section and found the mean time of defecation to be 21.1 ± 4.7 h and 30.00 ± 8.2 h and earlier in gum chewing and the control group.^[6] In this study, the time to first passage of faeces were, 30.7 ± 5.9

and 40.0 ± 9.0 h respectively in the gum and control groups ($P = 0.01$). In England Quah *et al.* failed to find any statistical difference in time to first defecation in a study on 38 patients after left colon cancer surgery studied.^[15] The obvious small sample size of the study may account for his result.

Prolonged abdominal surgeries have been known to increase the duration of POI. All 180 surgeries lasted <60 min. The mean duration of surgery of 38.6 ± 9 min in the study group and 35.5 ± 5 min in the control group were comparable. These results are comparable with most of the previous studies.^[6-8]

All the studied patients expressed satisfaction with postoperative sugar-free gum (orbit) chewing. Earlier studies had observed gum chewing to be beneficial to postoperative patients as it kept the mouth moist after surgery.^[16] This suggests that if included in postoperative protocol for patient management, compliance will be satisfactory. Economically, gum chewing is cheap, costing <100 Naira per patient, which is far less than the cost of prolonged hospital stay associated with POI. A sugar free chewing gum that contains the artificial sweetener sorbitol and other hexitols does not have the side-effects bloating, gas, and abdominal cramps. The mechanism of action of chewing gum has not been fully investigated. Chewing is a form of sham feeding that stimulates food digestion and secretion of salivary and hepatic glands through the vagus nerve stimulation and increases the plasma concentration of gastrin, neurotensin, pancreatic polypeptide, and duodenal alkaline secretion. Thus, gum chewing directly augments intestinal stimulation through gastrointestinal releasing hormones and increasing saliva and pancreatic juices and subsequently promotes ileus recovery.^[16]

We did not find any significant difference in the duration of hospital stay between the G group and control. (7.0 ± 2.0 vs. 8.0 ± 1.5) Chan *et al.* carried out a systematic review on the effect of chewing gum postoperatively on patients after resection of colorectal cancer between 1991 and 2009.^[17] He concluded that in addition to early return of bowel function, the length of hospital stay was reduced. Noble *et al.* agreed with this while some systematic reviews and meta-analyses by de Castro *et al.* and Noble *et al.* were on the contrary.^[18,19] There is a need to conduct further studies in obstetric patients with a large sample size in order to define the effect of gum chewing on length of hospital stay in emergency and elective cesarean sections separately.

Limitations of the study

It was not possible to blind the subjects postoperatively although they were not told the reason for chewing gum to reduce the element of self-bias. It was not possible to exclude patients with severe adhesions, as there was no way available to us to know. However if the surgery lasted longer than an hour, they were excluded.

Conclusion

Gum is cheap, effective, well-tolerated, and free of side effects. Our results suggests that gum chewing following cesarean section offers significant benefits in reducing the time to resolution of POI. Further studies should be encouraged to look into its effect on early lactation following surgery in line with its neuroendocrine effect.

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