REVIEW ARTICLE

Chewing Gum and its Role in Surgeries

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Abstract

Background: To know the effects of chewing gum and its effects on recovery on different types of surgeries.

Objectives: Several strategies and interventions have been tested to prevent or reduce postoperative ileus (POI), both pharmacological and non-pharmacological. One of these strategies is gum chewing, a new and simple modality, which can accelerate complication-free recovery of gastrointestinal (GI) function. Here we review several studies on chewing gum and its effects on recovery after different types of surgeries.

Methods: Studies from commonly searched databases like PubMed, Google Scholar, Scopus, Lilacus, and Cochrane Library with the following search terms, 'chewing gum' and 'postoperative ileus'. A total of 49 articles were obtained in total and only 15 were taken for review after taking into account the study criteria.

Conclusion: Gum chewing is reducing the time for flatus, time for bowel movement, and the length of hospital stay. Its role in various surgeries has different results.

Keywords: Bowel recovery, Chewing gum, Postoperative ileus.

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Introduction

Postoperative ileus (POI) is a common phenomenon after abdominal surgery. Postoperative ileus is the interval between surgery and passage of flatus/stool and tolerance of oral diet. The main reason is considered to involve several factors such as: blocked extracerebral signaling and the sympathetic nervous system, inflammatory response (both local and systemic), and endocrinological and hormonal effects.[1] After any abdominal surgery patients experience reduced gastrointestinal (GI) peristalsis owing to extensive dissection, postoperative exhaust, and long duration of anesthesia. Following abdominal surgery, there is a prolongation in the resumption of regular bowel movements and delayed defecation, lasting for 3–5 days, this is referred to as POI. Traditional interventions to prevent POI or restore bowel function after surgery include decompression of the stomach with a nasogastric tube, early mobilization of the patient to stimulate bowel function, epidural anesthesia, adequate pain control, and drugs such as metoclopramide, erythromycin, neostigmine, alvimopan, among others.[2]

In clinical practice, there is a lack of effective strategies for prevention and treatment of POI. Several strategies and interventions have been tested to prevent or reduce POI, both pharmacological and non-pharmacological. One of these strategies is gum chewing, a new and simple modality, which can accelerate complication-free recovery of GI function, although the underlying mechanism remains unclear.[3] Here we review several studies on chewing gum and their effects on recovery after different types of surgery.

Methods

We searched studies from commonly searched databases like PubMed, Google Scholar, Scopus, Lilacus, and Cochrane Library with the following search terms, 'chewing gum' and 'postoperative ileus'. The articles were selected based on the following criteria:

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- Should be conducted within the period of 2011–2020
- The intervention of the study should include should be postoperative gum chewing
- Should include at least one of the outcomes like time to first bowel sounds, time to first flatus, and first stools
- Meta-analysis and systemic reviews were excluded

A total of 49 articles were obtained in total and only 15 were taken for review after taking into account the study criteria.

Discussion

Definition of Postoperative Ileus

Postoperative ileus is defined as a transient impairment in the motility of the gastrointestinal (GI) tract in the postoperative period. This can affect all parts of the GI tract with differential recovery of normal function.[4]

Vather et al. in 2013[5] proposed a clinical definition of POI, which should have at least two of the following signs on or after the fourth postoperative day with no improvement after surgery. They are:

- Nausea and vomiting
- Not tolerating solid or semiliquid diet for the preceding 24 hours
- Not passed flatus or stools for the preceding 24 hours

- Distension of abdomen
- Evidence of ileus, radiologically

Physiology of Bowel Movements

The type of peristaltic contraction which happens during fasting is known as migrating motor complex (MMC) and is limited to the stomach and small intestine. This contraction extends for about 20–30 mins in the stomach or intestine occurring every 1½–2 hours.[6] Following surgery, the motility of the GI tract is temporarily impaired which is characterized by disorganized electrical activity and lack of coordinated propulsion. Gastric propulsion is usually orad and there is increased pyloric tone that contributes to abnormal gastric emptying. Similarly, the migratory motor complex (MMC) in the small bowel may be shortened and may also produce retrograde contractions, producing a delay in the small bowel transit. Some of the mechanisms underlying abnormal intestinal motility found after surgery have been explained, but, integrated understanding still remains elusive.[4]

Phases of Postoperative Ileus

Following abdominal surgery, there occurs transient inhibition of motility involving the entire GI tract. It is proposed that there are two phases involved, each with its own dynamics and pathophysiological mechanisms. The first phase is neurally mediated which involves the activation of neural reflexes during and immediately following surgery. The second phase is the inflammatory phase which starts 3–4 hours after surgery and it is responsible for the sustained and clinically more relevant GI motility inhibition.[7]

The Neurogenic Phase

This is the first phase in postoperative ileus which is neurally mediated. It involves the activation of neural reflexes during and immediately after surgery. The incision on the skin and opening of the peritoneal cavity induces an increase in adrenergic motor activity mediated by corticotropin-releasing factor (CRF) leading to acute intestinal paralysis. This involves a spinal loop with afferent splanchnic nerves synapsing in the spinal cord activating efferents traveling back to the gut. In intestinal loops when displaced and manipulated, the additional neural pathways get activated when the nociceptive stimuli become more intense, leading to more prolonged inhibition of motility. High threshold supraspinal pathways relay to the paraventricular and supraoptic nucleus of the hypothalamus and the hypothalamic and pontine-medullary nuclei such as the nucleus tractus solitarius, which are adrenergic in nature. Further intense intestinal stimulation activates vagally mediated pathways, which are inhibitory non-adrenergic, thus contributing to the neural phase of POI.[7]

The Inflammatory Phase

After 3–4 hours of intestinal manipulation, there is activation of inflammatory response. Manipulation of the intestine activates dendritic cells that produce interleukin (IL-12). The IL-12 adheres to T1 helper lymphocytes. From manipulated site, they migrate to non-manipulated intestinal sites and induce inflammation. They in turn secrete interferon (IFN- γ), which in turn recruits macrophages that suppress intestinal motility by producing nitric oxide (NO) and other mediators. This is known as the "field effect". There is also an increase in intestinal epithelial barrier permeability resulting in bacterial translocation and thus increasing the inflammation and postoperative ileus.[8] The effect of gum chewing on various surgeries and the comparison of various parameters are discussed below.

Time for Flatus

Andersson et al. studied the effect of chewing gum following pancreaticoduodenectomy and in his study, he found that the mean ± SD in the study and the control group were 3.7 ± 1.4 and 5.6 ± 4.4 respectively and the *p*-value was 0.340 which was not statistically significant.[1] Bujun et al., Ertas et al., and Yang et al. conducted studies on patients undergoing surgeries for malignancies. Bujun et al. studied the effect of chewing gum following laparoscopic gastrectomy for gastric cancer, the mean ± SD in the study and control group were 79.2 ± 24.2 and 83.4 ± 35.6 respectively. The *p*-value was 0.554, which was not significant.[2] Similarly Ertas et al. conducted the study on patients after complete surgical staging surgery for gynecologic malignancies. The mean ± SD in the study and control group were 34.0 ± 11.5 and 43.6 ± 14.0 and the *p*-value obtained was <0.001, which was statistically significant.[9] Yang et al. studied patients undergoing elective open proctectomy for rectal cancer. The mean ± SD 42.33 ± 3.46 in the study group and was 49.20 ± 1.42 in the control group and the *p*-value was 0.001 which was statistically significant.[3]

Similarly, Azuzieogu et al., Weekley et al., and Mohamed et al. conducted studies to know the effect of chewing gum following cesarean section. Ajuzieogu et al. conducted the study on 180 subjects following cesarean section. The mean ± SD in the study and control group were 24.8 ± 6.4 and 30.0 ± 10.0 and the *p*-value was 0.01 which was significant.[10] Weekley et al. conducted a study to know the time from birth to first flatus. The mean time for the first flatus in the study and control group were 3.01 hours and 4.88 hours.[11] In a study conducted by Mohammed et al, the mean ± SD in the study and control group are 19.96 ± 1.84 and 24.84 ± 1.45 and the *p*-value was <0.001, which was again statistically significant.[12]

Forrester et al., Heijkant et al., and Topcu et al. studied the effects of chewing gum following colectomy. Forrester et al. conducted the study in patients undergoing elective or laparoscopic colectomy. The *p*-value obtained was 0.744 which was not significant.[13] Heijkant et al. studied the effect on patients undergoing open colorectal surgery. He found that 50% of patients had passed flatus within two days in the study group and 47% of patients in the control group had passed flatus within two days and this difference was not significant.[14] In the study conducted by Topcu et al. following open colorectal surgery and he found that the mean ± SD in the study group was 51.07 ± 19.63 and 87.83 ± 25.89 in the study and control group. The *p*-value obtained was <0.001, which was statistically significant.[15]

There are various studies following cystectomy, following both open and robotic surgeries. Wang et al. studied the effect in patients undergoing radical cystectomy followed by ileum urinary diversions. He studied the effect in three groups of patients, the study group in whom chewing gum was given, the placebo group treated with an abdomen physical therapy machine and the control group which received regular postoperative care. In the gum chewing group, the median time to flatus was 57 hours (49–72 hours), 82 hours in the placebo group, and 81 hours in the control group, which was significantly shortened compared with the other two groups of patients.[16] Choi et al. studied in patients following open or robotic radical cystectomy for bladder cancer. He had four groups, namely patients undergoing open cystectomy with and without chewing gum and patients undergoing robotic cystectomy with and without chewing gum. The median time to flatus in the chewing gum group (open and robotic cystectomy) was 57.1 hours (43–78 hours) and in the control group was 69.5

hours (51–92 hours). The *p*-value obtained was <0.01, which was significant.[17]

Jaimez et al. conducted a study to know of effect of chewing gum in children undergoing open or laparoscopic appendectomy. The mean ± SD in the study and control group was 17.18 ± 8.18 and 24.37 ± 17.53. And this difference was not significant.[18] Jennings et al. conducted a study to know the effectiveness of chewing gum in pediatric patients undergoing posterior spinal instrumentation for idiopathic scoliosis.[19] Takagi et al. conducted a study following transperitoneal abdominal aortic surgery. Flatus was passed on postoperative day 1.49 in the study group and on postoperative day 2.35 in the control group. The *p*-value obtained was 0.0004 which was significant.[20]

Time for Bowel Movement

The mean ± SD for a bowel movement in the study conducted by Andersson et al. in the chewing gum group was 7.6 ± 2.7 and it was 9.1 ± 6.2 in the control group and the *p*-value was 0.882 which was not significant.[1] The mean ± SD for a bowel movement in the study conducted by Bujun et al., Ertas et al., and Yang et al. for the study group are 115.4 ± 34.2, 49.6 ± 18.7, and 66.07 ± 2.36 and for the control group, it was 125.7 ± 41.2, 62.5 ± 21.5 and 78.37 ± 1.62. The significant difference between the two groups was observed by Ertas et al. (*p*-value < 0.001) and by Yang et al. (*p*-value 0.001), whereas a significant difference was not observed by Bujun et al. (*p*-value 0.192).[2,9,3]

Following cesarean section, the first bowel movement was observed in the studies conducted by Ajuzieogu et al. and Mohamed et al. The mean ± SD in the study group was 30.7 ± 5.9 and 20.26 ± 3.25 and the control group was 40.0 ± 9.0 and 36.92 ± 2.94 in the respective studies. Both studies showed a significant differences between the groups (*p*-value 0.01 and < 0.001).[10,12]

Post-colectomy, studies conducted by Forrester et al did not show a significant differences between the two groups (*p*-value 0.198).[13] In the study conducted by Heijkant et al. 85% of the patients in the study group had their first bowel movement within four days whereas, only 57% of the patients in the control group had it within four days. The difference between the two groups was significant (*p*-value 0.006).[14] There was a significant difference observed between the two groups in the study conducted by Topcu et al. The mean ± SD in the study and control groups are 73.33 ± 30.29 and 137.20 ± 44.05 and the *p*-value was <0.001.[15]

Following cystectomy, in the study conducted by Wang et al., the median time for the first bowel movement was 95 hours (88–109 hours) in the study group, which was significantly shortened when compared in the placebo and control group, i.e., 109 hours (99–128 hours) and 108 hours (102–125 hours).[16] In the study by Choi et al., the median time in the chewing gum group was 76.7 hours (61–106 hours), and in the control group was 93.3 hours (75–115 hours). the *p*-value was < 0.01 which had a significant difference.[17]

Jaimez et al. obtained a mean ± SD of 29.91 ± 21.27 in the study group and 34.5 ± 22.78 in the control group. However, the mean difference was not significant.[18]

Length of Hospital Stay

The length of hospital stay was significant only in the studies conducted by Ertas et al., Heijkant et al., Topcu et al., and Mohammed et al. In a study conducted by Ertas et al. (*p*-value < 0.001) in which the study and the control group mean ± SD were 5.9 ± 1.1 and 7.0 ± 1.4 respectively.[9] In the studies conducted following colorectal surgery, conducted by Heijkant et al. and Topcu et al., the mean ± SD in the study group was 9.5± 4.9 and 7.63 ± 1.47. In the control group, it was 14.0 ± 14.5 and 9.47 ± 2.67. in both studies the *p*-value was significant (0.039 and 0.002 respectively).[14,15] Mohammed et al. had a mean ± SD of 32.79 ± 8.98 and 47.89 ± 1.34 in the study and control group respectively and the *p*-value (< 0.001) was significant.[12]

Conclusion

Gum chewing reduces the time for flatus, time for bowel movement, and the length of hospital stay. Its role in various surgeries has different results. In some surgeries, there is a statistically significant difference, whereas in some surgeries there is no significant difference. However, chewing gum has never been reported with side effects in any surgery. More studies are required to know the effect of chewing gum where there is a prolonged duration of surgery.

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References

1. Andersson T, Bjerså K, Falk K, Olsén MF. Effects of chewing gum against postoperative ileus after pancreaticoduodenectomy – A randomized controlled trial. BMC Res Notes 2015;8:37. DOI: 10.1186/s13104-015-0996-0.
2. Bujun Ge, Chen Q, Liu L, Huang Q, Lin R, Wang J, et al. Influence of gum-chewing on postoperative bowel activity after laparoscopic surgery for gastric cancer: A randomized controlled trial. Medicine (Baltimore) 2017;96(13):e6501. DOI: 10.1097/MD.0000000000006501.
3. Yang P, Long WJ, Wei L. Chewing xylitol gum could accelerate bowel motility recovery after elective open proctectomy for rectal cancer. Rev Invest Clin 2018;70(1):53–58. DOI: 10.24875/RIC.18002428.
4. Behm B, Stollman N. Postoperative ileus: Etiologies and interventions. Clin Gastroenterol Hepatol 2003;1(2):71–80. DOI: 10.1053/cgh.2003.50012.
5. Vather R, Bissett I. Management of prolonged post-operative ileus: Evidence-based recommendations. ANZ J Surg 2013;83(5):319–324. DOI: 10.1111/ans.12102.
6. Sembulingam K, Sembulingam P. Essentials of medical physiology. 6th edition. New Delhi: Jaypee Brother Medical Publishers; 2012. p. 219. DOI: 10.5005/jp/books/11696.
7. Stakenborg N, Gomez-Pinilla P, Boeckxstaens GE. Postoperative ileus: Pathophysiology, current therapeutic approaches. Handb Exp Pharmacol 2017;239:39–57. DOI: 10.1007/164_2016_108.
8. Venara A, Neunlist M, Slim K, Barbieux J, Colas P, Hamy A, et al. Postoperative ileus: Pathophysiology, incidence, and prevention. J Visc Surg 2016;153(6):439–446. DOI: 10.1016/j.jviscsurg.2016.08.010.
9. Ertas IE, Gungorduk K, Ozdemir A, Solmaz U, Dogan A, Yildirim Y. Influence of gum chewing on postoperative bowel activity after complete staging surgery for gynecological malignancies: A randomized controlled trial. Gynecol Oncol 2013;131(1):118–122. DOI: 10.1016/j.ygyno.2013.07.098.
10. Ajuzieogu O, Amucheazi A, Ezike H, Achi J, Abam D. The efficacy of chewing gum on postoperative ileus following cesarean section in Enugu, South East Nigeria: A randomized controlled clinical trial. Niger J Clin Pract 2014;17(6):739–742. DOI: 10.4103/1119-3077.144388.
11. Weekley C, Tucker MA. Use of gum chewing to decrease time from birth to first flatus and the incidence of postoperative ileus in postcesarean women. Journal of Obstetric, Gynecologic & Neonatal Nursing 2019;48(3):S105. DOI: https://doi.org/10.1016/j.jogn.2019.04.177.
12. Mohamed AI, Abd Elati IH, Mahdy AY. Effect of gum chewing on resumption of bowel functions and duration of postoperative ileus after cesarean section. Zagazig Nursing Journal 2015;395(3599):1–10.

13. Forrester DAT, Doyle-Munoz J, McTigue T, D'Andrea S, Natale-Ryan A. The efficacy of gum chewing in reducing postoperative ileus: A multisite randomized controlled trial. J Wound Ostomy Continence Nurs 2014;41(3):227–232. DOI: 10.1097/WON.0000000000000019.
14. Heijkant TC van den, Costes LMM, Lee DGC van der, Aerts B, Jong MO, Rutten HRM, et al. Randomized clinical trial of the effect of gum chewing on postoperative ileus and inflammation in colorectal surgery. Br J Surg 2015;102(3):202–211. DOI: 10.1002/bjs.9691.
15. Topcu SY, Oztekin SD. Effect of gum chewing on reducing postoperative ileus and recovery after colorectal surgery: A randomised controlled trial. Complement Ther Clin Pract 2016;23:21–25. DOI: 10.1016/j.ctcp.2016.02.001.
16. Wang Y, Meng YS, Fan Y, Chen C, Yu W, Hao H, et al. Effect of gum chewing on bowel function recovery in patients after radical cystectomy with urinary diversion. Beijing Da Xue Xue Bao Yi Xue Ban 2016;48(5):822–824. PMID: 27752163.
17. Choi H, Kim JH, Park JY, Ham BK, Shim J sung, Bae JH. Gum chewing promotes bowel motility after a radical retropubic prostatectomy. Asia Pac J Clin Oncol 2014;10(1):53–59. DOI: 10.1111/ajco.12113.
18. López-Jaimez G, Cuello-García CA. Use of chewing gum in children undergoing an appendectomy: A randomized clinical controlled trial. Int J Surg 2016;32:38–42. DOI: 10.1016/j.ijsu.2016.06.003.
19. Jennings JK, Doyle JS, Gilbert SR, Conklin MJ, Khoury JG. The use of chewing gum postoperatively in pediatric scoliosis patients facilitates an earlier return to normal bowel function. Spine Deform 2015;3(3):263–266. DOI: 10.1016/j.jspd.2014.12.001.
20. Takagi K, Teshima H, Arinaga K, Yoshikawa K, Hori H, Kashikie H, et al. Gum chewing enhances early recovery of bowel function following transperitoneal abdominal aortic surgery. Surg Today 2012;42(8):759–764. DOI: 10.1007/s00595-012-0180-2.