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Role of honey as early first feed after gastrointestinal resection and anastmosis

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Abstract

Introduction: Honey offers nutritious value as well as wound healing capabilities. Bactericidal, bacteriostatic, antifungal, antioxidant, and anti-inflammatory properties are all found in honey.

AIM: Our Aims is to assess the effect of use of honey in postoperative patient regarding healing of gastrointestinal anastomosis, and to evaluate the effect of use of honey on overall surgical outcome.

This was a randomized control trial conducted on patients undergoing exploratory laparotomy post-operative gastro intestinal resection anastomosis, reporting at Department of Surgery of MGM Medical College and MYH Hospital. Participants were divided into group A (with honey) and group B (without honey), each comprising 50 participants. Information was recorded on a predesigned, pretested and semi-structured questionnaire and the findings were compared.

Results: Mean age among Group A and B was found to be 39.40 ± 11.96 yrs and 40.26 ± 13.11 yrs. 76% of participants were males. 71%, 72% and 74% of participants reported history of chronic alcohol, tobacco/ smoking NSAID intake. Around 79% of study participants were diagnosed to have ileal perforation, followed by gangrenous small bowel (12%) and meckel's diverticulum (9%). Association of surgical site leak, presence of fever on postoperative day 3/6/10, surgical site wound infection on postoperative day 10 and serum procalcitonin levels on postoperative day 6 was found to be statistically significant among both the groups. This study underlines significant importance of honey intake on patient outcome thus it is advised to use honey after bowel resection.

Keywords: Wound Healing, Randomized Control Trial, Gastro Intestinal Resection, Exploratory Laparotomy.

Introduction

The gastrointestinal system is responsible for digestion, selective absorption, secretion, etc.[1] However, its "barrier" function is critical in preventing intraluminal bacteria and endotoxins from spreading to organs and

tissues. Gut "barrier" failure can be caused by one or more of three pathophysiological conditions: disruption of the indigenous gut microflora's natural ecological balance, reduced host immunological defenses, or physical damage of the gut mucosal barrier.[1]

In general surgery, small bowel resection is a regular technique. Common indications for small bowel resection include obstruction not amendable to adhesiolysis, suspected malignancies, traumatic and non-traumatic perforation, ischemic necrosis, Inflammatory bowel disease (IBD), symptomatic Meckel diverticulum or diverticular disease, etc.[2-5] Small bowel resection complications include superficial wound infections, anastomotic collapse or leak, fistulization, scar tissue formation, and more.[2] Anastomotic leak following surgery is associated with a mortality incidence of 6.2 percent to 37 percent.[3] When anastomotic leakage occurs, the risk of death increases four to sevenfold.[3]

Honey has long been utilized for therapeutic purposes and has a long history of usage for wound healing, and it has been extensively referenced in medical literature since antiquity.[1] Honey has been utilized as a cure-all in many cultures, including Indian, Islamic, Egyptian, Greek, Chinese, and others.[4]

It is the most valuable natural diet since it ensures that daily doses of necessary nutrients such as carbohydrates, minerals, amino acids, proteins, and vitamins are obtained.[4] Honey has a calorie content of 3000 calories per kilogram and 100 calories per table spoon; honey offers nutritious value as well as wound healing capabilities.[5] Honey has been used as a remedy for both internal and exterior bodily wounds from ancient times, with dual action, i.e. systemic and local, on wound healing.[4]

Honey has antibacterial properties[4]. Emergence of antibiotic-resistant microbial agents, as well as honey's robust effectiveness against them, has reignited interest in its medical use.[4] Many investigations have been undertaken since then, and they have revealed that honey has a variety of medical characteristics.[4] Honey promotes autolytic debridement, has antibacterial properties, and encourages wound tissue growth to speed up the healing process in dormant wounds. Finally, it starts anti-inflammatory activity, which lowers pain, oedema, and exudate production quickly.[4]

Oral honey is used to reintroduce food intake and avoid dehydration as a result of decreased food intake.[4] It works as a potent clinical entity by reducing post-operative inflammation, discomfort, fever, early post-operative ambulation, and early hospital discharge through a variety of complex mechanisms.[4] It's been used to treat surgical incisions, pressure ulcers, and catheter exit sites, among other wounds. Bactericidal, bacteriostatic, antifungal, antioxidant, and anti-inflammatory properties are all found in honey.[1] Several pain management techniques are being developed for use before, during, and after surgery, including the use of steroids, analgesics, antibiotics, and anti-nausea medications, all of which have shown some promising results in small studies while not increasing serious complications like surgical harm.[6]

Thus, a controlled trial was conducted to assess the effect of use of honey in postoperative patient regarding healing of gastrointestinal anastomosis and also to evaluate its effect on overall surgical outcome.

Methods

Study design: Randomised control trial

Study area: MGM Medical College and MYH Hospital, Indore.

Study duration: one year

Study population: Randomised control trial of 50 participants, undergoing exploratory laparotomy post-

operative gastrointestinal resection anastomosis, was enrolled and divided into two groups (group A and group B).

Inclusion criteria

1. Age between 18 - 70 years.
2. Patient undergoing exploratory laparotomy post-operative gastro intestinal resection anastomosis.
3. Patient with written informed consent.

Exclusion criteria

1. Age <17 years and > 70 years
2. Patients not giving consent.
3. Diabetic patient

Methodology: Permission to conduct the study was obtained from the ethical committee of MGM Medical College and MYH Hospital, Indore. The study was conducted on patients undergoing exploratory laparotomy post-operative gastro intestinal resection anastomosis, reporting at Department of Surgery of MGM Medical College and MYH Hospital. After obtaining informed consent and explaining the purpose of study to the participants, data collection was done and information was recorded on a predesigned, pretested and semi-structured questionnaire. Preoperative, intraoperative and postoperative workups were done, data was collected and analyzed.

Preoperative workup: Collection of socio-demographic variables such as age, gender, etc. Detailed history taking, including general examination and investigations were conducted.

Intraoperative workup: All operation were under general anesthesia with midline incision.

Postoperative workup: Two groups were divided randomly on the basis of honey intake by group A participants whereas Group B was control group which was given distilled water. Both the groups were given same treatment apart from honey as a differing entity. Group A patients were instructed to take Oral honey 2 tea spoon /6hrly equal to 10 ml honey /6hrly staring from post-operative day 2 (1ml honey =1.4 gm approx, Ideal dose recommended 1-2 gm/kg) till day 14th post operatively.

Results

Baseline characteristics of study participants

Table 1 depicts comparison of various variables among both the groups. Mean age among group A was found to be 39.40 ± 11.96 years and among B was found to be 40.26 ± 13.11 years.

Table 1: Comparison of various continuous variables among both the groups

Sn.	Variable	Group	Mean	SD	t test	p-value
1	Age (Yrs)	A	39.40	11.968	-.343	.733
		B	40.26	13.108		
2	VAS Pain Score POD 1	A	6.08	.396	0.000	1.000
		B	6.08	.396		
3	VAS Pain Score POD6	A	4.48	.863	0.235	0.814
		B	4.44	.837		
4	VAS Pain Score POD 10	A	4.08	.396	0.000	1.000
		B	4.08	.396		
5	VAS Pain Score POD 14	A	2.48	.863	0.235	0.814
		B	2.44	.837		

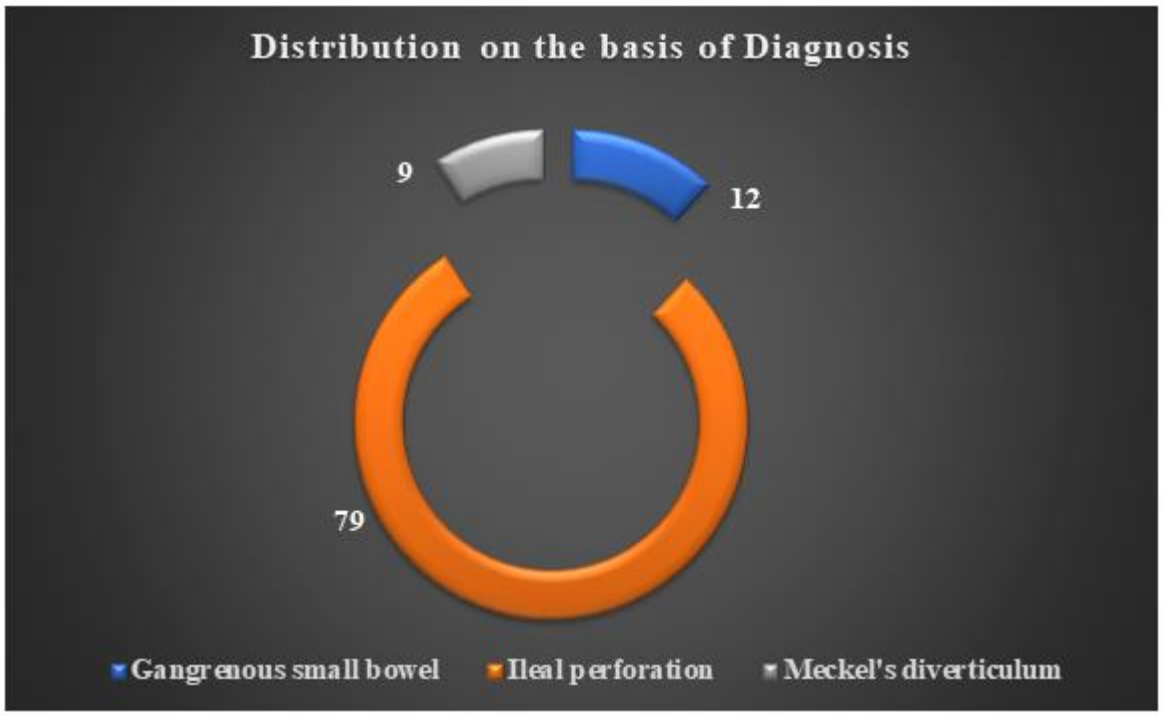
Patient baseline characteristics have been displayed in table 2. 76% of participants were males while 24% were females. Patients falling under A (with honey) group shows 82% for Male group while, 18% belonged to Female group. Patients falling under B (without honey) group shows 70% for Male group while, 30% belonged to Female group. 71% participants reported history of chronic alcohol intake. 70% of participants reported history of alcohol intake in group A and 72% of participants in group B. 72% of the participants reported history of tobacco/ smoking intake. 74% of participants reported history of tobacco/ smoking intake in group A and 70% of participants in group B. 13% of participants were found to have positive history of NSAID intake. 12% of participants reported history of long intake of NSAID in group A and 14% of participants in group B.

Table 2: Patient baseline characteristics

Sn.	Variable	Sub category	Group A N=50,(%)	Group B N=50,(%)	Total N=100,(%)	Chi sq, p value
1	Gender	Female	9 (18)	15 (30)	24 (24)	1.974, 0.160
		Male	41 (82)	35 (70)	76 (76)	
2	H/o alcohol	Present	35 (70)	36 (72)	71 (71)	0.049, 0.826
3	H/o tobacco/ smoking	Present	37 (74)	35 (70)	72 (72)	0.198, 0.656
4	H/o NSAID	Present	6 (12)	7 (17)	13 (13)	0.088, 0.766

Distribution of study participants on the basis of diagnosis have been depicted in figure 1.

Figure 1: Distribution of study participants on the basis of Diagnosis



Around 79% of study participants were diagnosed to have ileal perforation, followed by gangrenous small bowel (12%) and meckel's diverticulum (9%). Chi square value was found to be 0.457 with insignificant p value of 0.796 indicating that no association was observed in diagnosis of both the groups. None of the

characteristics were found to be significantly associated among both the groups. ($p<0.05$)

Table 3: Postoperative presentation profile of patients

Sn.	Variable	Sub category	Group A N=50,(%)	Group B N=50,(%)	Total N=100,(%)	Chi sq, p value
1	Surgical site leak	Present	6 (12)	16 (32)	22 (22)	5.828, 0.016
2	Ambulation	POD 2	19 (38)	19 (38)	38 (38)	0.000, 1.000
		POD 3	27 (54)	27 (54)	54 (54)	
		POD 4	4 (8)	4 (8)	8 (8)	
3	Return of bowel sound	POD 2	2 (4)	2 (4)	4 (4)	0.044, 0.998
		POD 3	20 (40)	21 (42)	41 (41)	
		POD 4	26 (52)	25 (50)	51 (51)	
		POD 5	2 (4)	2 (4)	4 (4)	
4	Fever (Present)	POD 1	41 (82)	47 (94)	88 (88)	3.409, 0.065
		POD 3	21 (42)	31 (62)	52 (52)	4.006, 0.045
		POD 6	6 (12)	14 (28)	20 (20)	4.000, 0.046
		POD 10	6 (12)	15 (30)	21 (21)	4.882, 0.027
		POD 14	9 (18)	16 (32)	25 (25)	2.613, 0.106
5	Wound infection	POD 3	13 (26)	20 (40)	33 (33)	2.216, 0.137
		POD 6	8 (16)	16 (32)	24 (24)	3.509, 0.061
		POD 10	6 (12)	16 (32)	22 (22)	5.828, 0.016

As per table 3, out of total 50 patients of group A only 6 (12%) leaked post- operatively compared to 50 patients of group B out of which 16 (32%) showed suture leak post-operatively. The above table shows that the association between surgical site leak status and different groups was found to be statistically significant. ($p<0.05$)

54% of participants were ambulated on post- operative day 3 while ambulation on day 2 and day 4 was found to be in 38% and 8% of participants respectively. Patient falling under group A and B showed almost equal number of participants with respect to ambulation on postoperative day 2, 3 and 4. In majority (51%) of the participants, return of bowel sound was observed on 4th postoperative day. This was followed by 41% of participants with bowel sound return on POD 3.

Fever was reported among 88%, 52%, 20%, 21% and 25% of participants on POD 1, POD 3, POD 6, POD 10 and POD14 respectively. Association of fever on postoperative day 3, 6 and 10 among both the groups was found to have a significant statistical difference ($p<0.05$).

33% of participants reported with wound infection on 3rd post-operative day. While, 6th and 10th post-operative day wound infection was observed among 24% and 22% of participants respectively. On POD 3, POD 6 and POD 10 wound infection was reported in 26%, 16% and 12% (group A) and 40%, 32% and 31% (group B) of participants respectively. Association between status of wound infection on postoperative day 10 and different groups was statistically significant with $p <0.05$.

Table 1 shows the comparison of mean VAS Pain score on POD 1, POD 6, POD 10 and POD 14 among both the groups. Mean pain score in group A was found to be 6.08 ± 0.396, 4.48 ± 0.863, 4.08 ± 0.396 and 2.48 ± 0.863 on POD1, POD6, POD10 and POD14 respectively. Similarly, mean pain score in group B was found to be 6.08 ± 0.396, 4.44 ± 0.837, 4.08 ± 0.396 and 2.44 ± 0.837 on POD1, POD6, POD10 and POD14 respectively. No significant association was observed with pain score.

Table 4: Postoperative laboratory profile of patients

Variable	Sub category	Group A N=50,(%)/ Mean±SD	Group B N=50,(%)/ Mean±SD	Total N=100, (%)	Chi sq/ t test, p value
TLC (>11000 or <4500 cells/ml)	POD 1	49 (98)	49 (98)	98 (98)	0.000, 1.000
	POD 6	7 (14)	13 (26)	20 (20)	2.250, 0.134
	POD 14	11 (22)	18 (36)	29 (58)	2.380, 0.123
Serum Procalcitonin	POD 1	12.116 ± 1.7215	12.198 ±1.7001	-	-.240, 0.811
	POD 6	12.116 ± 1.7215	12.198 ±1.7001	-	-3.007, 0.003

98% participants reported abnormal TLC levels on POD 1, while only 20% and 29% of the participants had abnormal levels on POD 6 and POD 14 respectively. No significant association was observed with respect to abnormal TLC levels between both the groups. Mean procalcitonin levels among group A and B on POD 1 was found to be 12.116 ± 1.72 ng/ml and 12.198 ± 1.70 ng/ml respectively. Mean procalcitonin levels among group A and B on POD 6 was found to be 12.116 ± 1.72 ng/ml and 12.198 ± 1.70 ng/ml respectively. On post-operative day 6 when two groups were compared on the basis of mean value of serum procalcitonin, significant difference found between Group A and Group B with $p < 0.05$.

Table 5: Prognostic score of patients

Variable	Sub category	Group A N=50,(%)/ Mean±SD	Group B N=50,(%)/ Mean±SD	Total N=100, (%)	Chi sq/ t test, p value
BOEY Score	0	4	3	7	5.278, 0.153
	1	17	14	31	
	2	24	19	43	
	3	5	14	19	
MPI Score		27.82 ± 4.044	28.06 ± 3.971	-	-.299, 0.765

Table 5 shows that out of 100 participants, majority (43%) of them reported BOEY score of 2. This was followed by score of 1, 3 and 0 to be observed among 31%, 19% and 7% of participants respectively. The mean MPI score in group A participants was found to be 27.82 ± 4.04 and in group B participants was 28.06 ± 3.971. No significant association was observed among both the groups with the prognostic scores of the patient.

Table 6: Patient outcome following surgery

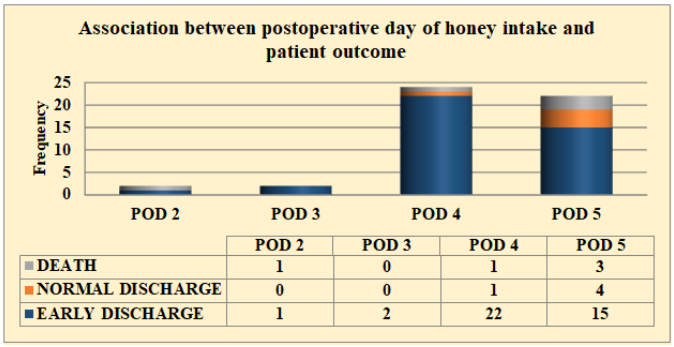
Variable	Sub category	Group A N=50,(%)/ Mean±SD	Group B N=50,(%)/ Mean±SD	Total N=100 (%)	Chi sq/ t test, p value
Patient Outcome	Cured (early discharge)	40	11	51	34.087, <0.001
	Cured (normal discharge)	5	25	30	
	Death	5	14	19	
Duration of Hospital Stay (Days)		7.16±1.017	7.98±1.059	-	-3.94, <0.001

As per table 6, 81% of study participants were discharged while only 19% reported the outcome as death. 10% of participants from group A reported death as outcome while 28% from group B reported death. The association between patient outcome and different groups was found to be highly significant (p<0.01).

Mean hospital stay of Group A participants was 7.16 ± 1.017 days which was less than Group B participants with stay duration of 7.98 ± 1.059 days. The two groups were shown to be highly significantly different (P<0.01) which means Group A patients were discharged earlier than Group B & have lesser duration of hospital stay. (Table 6)

Figure 2 displays comparison of postoperative days of honey intake with patient outcome. No significant association was observed with Chi square value of 8.314, and p value of 0.216.

Figure 2: Association between postoperative Day of honey intake and patient outcome



Discussion

A lot of studies have been conducted to investigate the role of honey in accelerating the wound healing process and reducing the infection rate of wounds of various types of clinical causes. However, there are handful data available on the role of oral honey in post-operative inflammation, pain, fever, wound infection, reduction. Post-operative complications are the main things to be focused and its proper management plays a vital role in overall outcome of patient.[7] Most of the studies were done either in rat models or by topical use.

Through this study we would like to reveal the hidden benefits of honey by its oral administration in post-operative patients undergoing exploratory laparotomy post-operative gastro intestinal resection anastomosis. A total 100 patients were included, out of which two groups were divided on randomly i.e. Group A (With Honey) and Group B (Without Honey).

In our study the mean age among Group A was found to be 39.40 ± 11.96 yrs and among B was found to be 40.26 ± 13.11 yrs. 76% of participants were males. 71%, 72% and 74% of participants reported history of chronic alcohol, tobacco/ smoking NSAID intake. Around 79% of study participants were diagnosed to have ileal perforation, followed by gangrenous small bowel (12%) and meckel's diverticulum (9%).

Honey is expected to expedite wound healing and increase epithelialization, hence reducing pain intensity. But as per our study, difference in the mean pain score value of patients of two groups was found to be statistically non-significant (P>0.05). The mean VAS pain score among Group A was found to be 6.08 ± 0.396 on post-operative day 1, 4.48 ± 0.863 on post-operative day 6, 4.08 ± 0.396 on post-operative day 10 and 2.48 ± 0.863 on post-operative day 14. Mean VAS pain score among Group B was found to be 6.08 ± 0.396 on post-operative day 1, 4.44 ± 0.837 on post-operative day 6, 4.08 ± 0.396 on post-operative day 10 and 4.44 ± 0.837 on post-operative day 14. This was similar to the results of study conducted by **Ankur Maheshwari et al (2020)**[4] where it was observed that on POD 1, the difference in mean pain scores from different post-operative days between the two groups was statistically non-significant (P>0.05). But on POD 6, POD 10, and POD 14 group data, on the other hand, were determined to be statistically significant (P<0.05). Dissimilar to our findings, studies by **Peyman Boroumand et al 2013**[8] and **Subrahmanyam**[6] discovered that honey has a substantial effect in reducing postoperative pain and hence the requirement for analgesics.

Honey, on the other hand, provides some critical nutrients needed to support the synthesis of glycosaminoglycans, which are one of the key components produced by fibroblasts in the wound region, in addition to sugars, amino acids, minerals, vitamins, and a low level of peroxide. Furthermore, honey has stronger antioxidant properties against a range of reactive oxygen species, which play an important role in inflammation reduction. Which serve a critical role in wound prevention. Similar results were noted in our study where only 22% of participants reported postoperative suture leak with only 12% of group A patients reporting. The association between surgical site leak status and different groups was found to be statistically significant (p<0.05). Similar association was observed between wound infection and POD 10 among both the groups.

In recent study, patient falling under Group A and B showed almost equal number of participants with respect to ambulation on postoperative day 2, 3 and 4. Insignificant association was observed between different groups and ambulation status. This finding was contrary to the observations by **Ankur Maheshwari et al (2020)**[4] where patients in the A group (without honey) had a lower percentage of ambulatory patients on early post-operative days (day 2, day 3) than patients in the B group (with honey).

In terms of biochemical measures, serum procalcitonin, C-reactive protein, and total leucocyte count are all relevant post-operative markers for inflammation. Oral honey promotes wound epithelization and reduces inflammation. As per our study on post-operative day 6, mean procalcitonin levels among Group A and B was found to be 12.116 ± 1.72 ng/ml and 12.198 ± 1.70 ng/ml respectively, with statistically significant associations (p<0.05). Similar results were observed in a study by **Ankur Maheshwari et al (2020)**[4], where it was found that Group B (with honey) had a higher drop in serum procalcitonin levels than Group A (without honey) (p<0.05).

As per recent study, 81% of study participants were discharged. The association between patient outcome and different groups was found to be highly significant (p<0.01). But the association between patient outcome and postoperative day of honey intake was not significant statistically. This indicates that oral intake of honey

shows significant difference in patient outcome but there is no significance on the postoperative day of intake.

Similar to our findings, many studies reported better prognosis among the participants following use of honey. **Karsten and colleagues**[9] demonstrated the effect of honey in reducing oral mucositis caused by chemotherapy and radiotherapy in oral cancer patients. Similarly, in a randomized controlled trial on rats by **Muhammad Izani Aznan et al (2016)**[3]**,** it was found that the results for tensile strength by bursting pressure measurement between Group I (control) and Group II (experimental) (study). In both groups, the difference in fibroblast count was statistically significant ($p<0.001$) indicating better healing. The findings of **O.D Eyarefe et al (2012)**[10] revealed that the honey/glutamine combination had a therapeutic advantage over either glutamine or honey, indicating that it could be a better option for people with short bowel syndrome. As per **Lychkova et al. (2014)**[11] honey and pollen have been shown to prevent the development of painful gastric motility, indicating that they have a gastroprotective effect.

Honey has been used in the past and continues to be used in the present to support medical articles. Scientific research on this product is gaining popularity. The increasing number of trustworthy studies confirming the usefulness of honey; the monetary interest of the honey business; and the complicated and unpredictable nature of this commodity, which provides a challenge to scientists, are all reasons for such interest (126)

Conclusion:

From the present study, it can be concluded that among the various clinical and laboratory parameters studied in relation to gastro-intestinal post-operative resection and anastomosis; status of surgical site leak, fever on postoperative day 3, 6, and 10, presence of wound infection on postoperative day 10, serum procalcitonin levels on postoperative day 6, mean duration of hospital stay and overall patient outcome holds a significant value as a marker in participants receiving oral honey in comparison to those receiving distilled water.

This study also underlines the importance of honey intake on patient outcome. Oral intake of honey shows significant difference in patient outcome although there is no significance on the postoperative day of intake. Hopefully, no adverse reaction was noted; such as bleeding, readmission in hospital, honey intolerance, etc. Honey may have a large domain of clinical benefits which needed to studied and supported by valuable data so that we can start taking benefits from conventional adjunct.

We advise all of our patients to use honey after bowel resection as we have got good results from current study.

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