OBESITY AND CECAL INTUBATION TIME

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ABSTRACT

Background/Aim

Obesity is a much-debated factor with conflicting evidence regarding its association with caecum intubation rates during colonoscopy. We aimed to identify the association between cecal intubation (CI) time and obesity by eliminating confounding factors.

Method

Retrospective chart review of subjects undergoing outpatient colonoscopy. The population was categorized by gender and Obesity {BMI (kg/m2)- I (< 24.9), II (25 to 29.9), III (>=30)}. CI time was used as marker of difficult colonoscopy. Mean CI time (MCT) was compared for statistical significance using ANOVA test.

Results

926 subjects were included. MCT was 15.7 ± 7.9 min. Among male subjects, MCT was 15.9 ± 7.9 min whereas for females it was 15.5 ± 7.9 min. MCT (in min) among females across BMI category I, II and III was 14.4 ± 6.5, 15.5 ± 8.3 and 16.2 ± 8.1 (p = 0.55) whereas for males it was 16.3 ± 8.9, 15.9 ± 8.0 and 15.6 ± 7.2 (p = 0.95) respectively.

Conclusions

BMI had positive association with CI time among female group in contrast to negative association among male group.

KEYWORDS

Obesity, BMI, Cecal intubation time, Gender
INTRODUCTION

Colorectal cancer (CRC) is one of the leading causes of malignant neoplasm-related mortality worldwide \([1, 2]\). In 2012, CRC was responsible for 694,000 deaths worldwide accounting for 8.5% of all cancer related deaths \([2]\). It is estimated that in US alone 93,090 new cases of colorectal cancer will be diagnosed in 2015 \([3]\). Obesity is a proven risk factor for CRC \([4, 5]\). It is associated with an increased risk of incident CRC in men of all ages and in women between the ages 50–66 \([6]\). Obesity, a modifiable risk factor, has also been found to increase the risk of adenoma and advanced adenoma recurrence \([7]\).

Body habitus and cecal intubation during colonoscopy have a unique relationship. There is evidence to suggest that lean subjects offer a challenge to endoscopist in achieving cecal intubation during colonoscopy \([8-10]\). This has been attributed to the paucity of the visceral fat pad and the smaller size of abdominal cavity. Few techniques and maneuvers routinely required during the endoscopic examination like repositioning and abdominal pressure application are more difficult to perform on obese patients. It appears there is an optimum BMI which might be considered “just right” for the colonoscopy. Obesity is also an independent predictor of inadequate bowel preparation for colonoscopy \([11-12]\), which indirectly also contributes towards difficult colonoscopy. In this context, and taking into account that obesity has reached epidemic proportions in America \([13]\) and Europe \([14]\), colonoscopy in obese patients represents a challenging issue for an endoscopist, one that is frequently encountered in day to day practice.

Our study aims to delineate the association between BMI and the cecal intubation difficulty during colonoscopy, after controlling for other confounding variables like
endoscopist’s experience, quality of bowel preparation and any risk factors for intra-abdominal adhesions.

MATERIALS AND METHODS

STUDY OBJECTIVE

To define the association between obesity and cecal intubation time during colonoscopy after controlling for the confounding factors.

STUDY DESIGN

This was a retrospective observational cohort study done at a tertiary care teaching hospital. The study protocol was approved by the Institutional Review Board of Einstein Medical Center (IRB no. 4550 EXE). Written informed consent was not required since it was a retrospective chart review study.

STUDY POPULATION

Inclusion criteria:-

1.) All subjects presenting for an outpatient colonoscopy to our institution over a span of 18 months.

Exclusion criteria:-

Subjects with

1.) Poor bowel preparation

2.) Failure of caecum intubation

3.) Personal history of Inflammatory bowel disease (IBD)
4.) History of colectomy or abdomino-pelvic surgery (as defined below)

5.) Personal or family history of colon cancer

6.) Procedures done by fellows

STUDY METHOD

The colonoscopy and anesthesia procedure reports were reviewed to collect data regarding age, gender, weight, height, timing of the procedure (morning versus afternoon), endoscopist’s experience (fellow versus attending), past medical history (IBD, CRC), past surgical history (abdomino-pelvic surgery including laparoscopic procedures but excluding umbilical/inguinal hernia repair and transurethral/transvaginal procedures), family history (colon cancer), bowel preparation quality and cecal intubation time. The exclusion criteria were then applied to the initial study population to remove the effect of all the confounding variables. Weight and height was then used to calculate BMI. All the data was recorded on excel sheets without including any identifying information to maintain anonymity. The final study population (after applying the exclusion criteria) was then divided into male and female subgroups. Each gender group was further categorised based on body mass index (BMI) into three categories- I (Non-Obese, BMI < 25), II (Overweight, BMI 25 to 29.9), III (Obese, BMI =>30). Mean cecal intubation (CI) time was then computed for each category. Significance of the difference in CI time values was determined using ANOVA, which was applied using Stata for mac version 13.0 (Statacorp LP, Texas). P value of less than 0.05 was used to determine statistical significance.

RESULTS
Our study included 926 subjects reporting for outpatient colonoscopy. Mean age of the study population was 58.8 years and was composed of 47.7% females and 52.3% male subjects. The demographic characteristics have been summarized in Table 1.

Distribution of cases across the time of day i.e. morning or afternoon was non-uniform, with 57.8% procedures being done in morning session and 42.2% in the afternoon session. Mean Colonoscopic cecal intubation time for the study population was $15.7 \pm 7.9$ minutes (min). Among male subjects, MCT was $15.9 \pm 7.9$ min whereas for females it was $15.5 \pm 7.9$ min (Figure 1). Mean CI time for female gender across BMI categories I, II and III was $14.4 \pm 6.5$ min, $15.5 \pm 8.3$ min and $16.2 \pm 8.1$ min ($p = 0.55$) respectively (Figure 2). Mean CI time for male gender across BMI category I, II and III it was $16.3 \pm 8.9$ min, $15.9 \pm 8.0$ min and $15.6 \pm 7.2$ min ($p = 0.95$) respectively (Figure 2).

DISCUSSION

Obesity has been known to increase the incidence of colorectal cancer and colon adenoma for some time now, which makes it even more important to screen people with a high BMI. There are several methods available to screen for colon cancer including fecal occult blood test, flexible sigmoidoscopy, but the one with best early colon cancer detection rate is a colonoscopy. There has been a considerable increase in the number of colonoscopies in the past few years especially since it became standard practice to offer a colorectal cancer screening to all individuals above 50 years of age or earlier if so indicated. This sparked a lot of research into the factors that could predict a difficult colonoscopy.

The endoscopist’s level of training, quality of bowel preparation, body habitus, subject’s gender, intra-abdominal adhesions secondary to previous surgery and
presence of angulations among large bowel loops predicts the level of difficulty in achieving cecal intubation among the subjects undergoing colonoscopy\textsuperscript{[15]}. The association between body weight and the technical difficulty in achieving cecal intubation during colonoscopy has been a topic of debate. There is conflicting evidence to suggest that both lean and obese subjects presents a challenge to the endoscopist during colonoscopy\textsuperscript{[8, 9, 15-17]}. Obesity has been independently tied to poor bowel preparation, which in turn can also lead to a difficult and prolonged colonoscopy\textsuperscript{[12]}.

To truly appreciate the association between body weight and difficult colonoscopy, we need to eliminate the effect of confounding variables. To achieve this, we designed our study to exclude the subjects with poor bowel preparation, procedures done by fellow and subjects with history of abdominal/pelvic surgery. We used cecal intubation time as a scale to estimate the degree of difficulty of the colonoscopy.

There was minimal difference in the mean cecal intubation time for the male (15.9 ± 7.9 min) and female subjects (15.5 ± 7.9 min). Interestingly, the mean CI time had positive association with BMI for female subjects but had negative association among male subjects (Figure 2). Although it failed to achieve statistical significance it did highlight an important trend. The positive association amongst females is consistent with the literature regarding increased difficulty of colonoscopy among obese population. The difference between the genders could be explained by the variation in their tendency to accumulate fat at different places. It is known that males are in general more prone to accumulate abdominal fat whereas females are more prone to accumulate fat in gluteal region and limbs before and in greater amount than abdominal fat\textsuperscript{[18]}.
Based on our literature review, our study is unique because it attempts to control a lot of confounding variables to delineate the true association between body weight and difficult colonoscopy. Although the absolute difference across different groups based on BMI is minimal but the consistent trend makes our results interesting and raises new questions before us, which need to be answered with future research.

Our study comes with few limitations. Being a retrospective single center study the results cannot be generalized. BMI, although a widely accepted scale for obesity, is not a true measure of Intra-abdominal fat\(^{19}\). It neither differentiates between fat and muscle, nor between the type and site of fat accumulation\(^{19}\). Nagata N et al found that subcutaneous fat was the best predictor of cecal intubation time, among all the indices of obesity\(^{16}\). But, since CT scans for Abdominal fat measurement are not recommended in routine clinical practice due to the unnecessary radiation exposure and the increased cost of healthcare, we used BMI to characterize obesity. Given the fact that waist hip ratio is a better marker of intra-abdominal fat, and in light of the above findings we expect waist hip ratio to better correlate with cecal intubation time. It may be considered as the preferred index of obesity for future studies given its cost-effectiveness and harmlessness\(^{19}\).

Our study results have important clinical implications. It provides more accurate and reliable association between obesity and difficult colonoscopy across different genders. It changes the endoscopist’s preconceived notions about obese patients undergoing colonoscopy. These results will also help in better and accurate time allotment for colonoscopy, thus avoiding delays and improving workflow within the
endoscopy suite. Larger multicenter trials with better scales to estimate visceral fat are required to confirm our findings.

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CONFLICT OF INTEREST STATEMENT

None of the authors disclosed any conflicts of interests.
FIGURE LEGENDS

Figure 1: Distribution of Caecum intubation time across gender

Figure 2: Caecum intubation time across BMI for each gender
TABLE 1: Demographic Characteristics of the study population

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<thead>
<tr>
<th>Demographic Characteristics</th>
<th>BMI Category I (&lt;25)</th>
<th>BMI Category II (25-29.9)</th>
<th>BMI Category III (&gt; or =30)</th>
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<tbody>
<tr>
<td>AGE</td>
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<td>58.74 (8.9)</td>
<td>58.29 (9.3)</td>
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<td>Median 59</td>
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<td>Range 24-87</td>
<td>36-90</td>
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<td>SEX</td>
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<td>206 (47.3%)</td>
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Figures for Obesity and Cecum Intubation Time
Figure 1: Distribution of Caecum intubation time across gender

- Composite population: 15.7 minutes
- Male: 15.9 minutes
- Female: 15.5 minutes
Figure 2: Caecum intubation time across BMI for each gender

CI time versus Gender and BMI

- Non-Obese (BMI < 25)
- Overweight (BMI 25 to 29.9)
- Obese (BMI =>30)

Minutes:
- Female:
  - Non-Obese: 14.4 minutes
  - Overweight: 16.3 minutes
  - Obese: 16.2 minutes

- Male:
  - Non-Obese: 15.5 minutes
  - Overweight: 15.9 minutes
  - Obese: 15.6 minutes