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Quality of bowel cleansing in hospitalized patients undergoing colonoscopy: A multicentre prospective regional study

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ABSTRACT

Background: Quality of bowel cleansing in hospitalized patients undergoing colonoscopy is often unsatisfactory. No study has investigated the inpatient or outpatient setting as cause of inadequate cleansing.
Aims: To assess degree of bowel cleansing in inpatients and outpatients and to identify possible predictors of poor bowel preparation in the two populations.
Methods: Prospective multicentre study on consecutive colonoscopies in 25 regional endoscopy units. Univariate and multivariate analysis with odds ratio estimation were performed.
Results: Data from 3276 colonoscopies were analyzed (2178 outpatients, 1098 inpatients). Incomplete colonoscopy due to inadequate cleansing was recorded in 369 patients (11.2%). There was no significant difference in bowel cleansing rates between in- and outpatients in both colonic segments. In the overall population, independent predictors of inadequate cleansing both at the level of right and left colon were: male gender (odds ratio, 1.20 [1.02–1.43] and 1.27 [1.05–1.53]), diabetes mellitus (odds ratio, 2.35 [1.68–3.29] and 2.12 [1.47–3.05]), chronic constipation (odds ratio, 1.60 [1.30–1.97] and 1.55 [1.23–1.94]), incomplete purge intake (odds ratio, 2.36 [1.90–2.94] and 2.11 [1.68–2.65]) and a runway time >12 h (odds ratio, 3.36 [2.40–4.72] and 2.53 [1.74–3.67]).
Conclusions: We found no difference in the rate of inadequate bowel preparation between hospitalized patients and outpatients.

1. Introduction

High-quality, safe and effective colonoscopy requires a good preparation of the colon before the procedure [1]. An ideal preparation for colonoscopy should be rapidly and completely able to remove all faecal material in the colon without causing macroscopic or histological alterations of colonic mucosa; moreover, the colon cleansing should not cause any discomfort and should ensure safety for the patients [2,3].

Inadequate colon preparation, defined as the inability to visualize polyps of 5 mm in size or larger, may lead to cancel or repeat procedures and compromise patient safety, quality of care, and cost effectiveness [1,4]. Specifically, poor bowel preparation is associated with increased technical difficulties, longer durations of the endoscopic examination, higher risks of perforation, and reduced adenoma detection rates; these factors could lead to an increase of the costs as a consequence of repeated colonoscopies and prolonged hospitalizations [1,5]. Inadequate bowel cleansing has been reported in up to 30% of patients undergoing colonoscopy.

A number of factors influencing the quality of colon cleansing have been identified in previous studies: the runway time, the type

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of diet before colonoscopy (liquid or low-fibre), male gender, the use of high polyethylene glycol (PEG) preparations versus other laxatives, split-dose versus non-split-dose schedule, and body mass index (BMI) [6–13].

The degree of bowel cleansing in hospitalized patients undergoing colonoscopy is often regarded as unsatisfactory compared to that of outpatients. This inadequate preparation is usually attributed to inpatients' comorbid conditions and concomitant medications [4]. To date, no focused study investigated the inpatient or outpatient setting as a specific cause of inadequate cleansing.

The primary aim of the present study was to compare the degree of bowel cleansing in inpatients versus outpatients; secondary aim was to identify potential predictors of poor bowel preparation in the two populations.

2. Methods

2.1. Patients

The Preparazione Intestinale Soddisfacente per la COlonscopia in Pazienti Ospedalizzati (PISCoPO) study group is a collaborative initiative developed under the auspices of the Italian Society for Digestive Endoscopy (SIED) – Campania Regional section – to prospectively collect data on colonoscopies performed in 25 academic or community-based endoscopy units of Campania region in Southern Italy.

Consecutive patients undergoing colonoscopy for any indication were enrolled in this prospective multicentre observational study during a 4-months run in period from May 2013 through August 2013.

Bowel preparation could be performed according to common local practice in the participating centres, and included: 4L PEG (high volume); 2L PEG with ascorbic acid (low volume); or sodium picosulphate plus magnesium citrate. Moreover, two different regimen schedules were used: split-dose regimen (half the amount given the evening before and half the amount given the morning of the procedure for colonoscopies performed after 12:00) or non-split-dose regimen, which is the full dose given the evening before the day of the scheduled procedure.

2.2. Outcome measures and definitions

For each patient a purpose-built case report form was used to record the following data: demographics (age, sex, weight, height, BMI); indication for colonoscopy, i.e. symptoms (bleeding, anaemia, weight loss, abdominal pain, change of bowel habits), screening (patients with positive faecal occult blood testing) or surveillance colonoscopy (family history of colorectal cancer/polyps, previous polypectomy or surgery); personal medical history including cardiovascular, neurologic and/or metabolic comorbidities; chronic liver, lung or kidney diseases; concomitant medications with details of any medication taken chronically or in the last month prior to colonoscopy; bowel habits of the patient prior to colonoscopy or hospital admission; the clinical setting, i.e. outpatients or hospitalized patients, including the type of medical or surgical facility (internal medicine, general or specialty surgery, geriatric, orthopaedic, gynaecology, neurology, psychiatric, etc.); details of bowel preparation, including type and amount of laxative (4L PEG, 2L PEG with ascorbic acid, sodium picosulphate plus magnesium citrate), split dose or non-split dose schedule, type of diet the day before the procedure (low-residue), compliance to the purge intake (complete, more than 75% or less than 75% of the total amount), runway time in hours from the last intake of purge to the procedure (<6 h, 6–12 h or more than 12 h), explanation of the procedural steps for adequate colon cleansing by physicians or nurses, with or without illustrative material.

The efficacy of bowel cleansing was rated using the Boston Bowel Preparation Scale (BBPS). The BBPS is a bowel cleanliness rating scale originally designed and validated for use during colonoscopy-oriented research. It is based on the summation of three individual colonic segment scores (from the right, transverse and left colons) to indicate the degree of bowel visualization [14,15]. Total BBPS scores have been associated with clinical outcomes such as polyp detection rates, recommendations for repeated procedures, and colonoscope insertion and withdrawal times. A total BBPS score $\geq$6 and/or all segment scores $\geq$ 2 provided a standardized definition of good/excellent cleansing level. Total BBPS scores of 3–5 (i.e. adequate visibility of mucosa following cleansing manoeuvres) was categorized as adequate cleansing. BBPS scores $\leq$2 defined poor or insufficient bowel preparation leading to the abortion of the colonoscopy.

The PISCoPO study was approved by the Institutional Review Boards of each participating centre. In addition, all eligible patients provided written informed consent.

2.3. Statistical analysis

Descriptive analysis included calculation of rates and proportion for categorical data as well as mean (standard deviation [SD]) or median (interquartile range) for continuous data. The Student's *t*-test was used to test for association between variables and outcome. Odds ratios and their 95% confidence intervals were used to quantify the level of association. Multiple logistic regression with backward stepwise variable selection was used to identify the independent predictors of outcomes of interest. Candidate variables for inclusion in a model included any variable significant at a *P* value of 0.10 or less on univariate analysis. Two-tailed tests with a significance level of 5% were used throughout.

All calculations were made using the Statistical Package for Social Sciences (SPSS software v.15.0) for Windows.

3. Results

Data from a total of 3276 colonoscopies were analyzed. There were 2178 outpatients and 1098 inpatients (53% males, mean age 61 $\pm$ 20 years). Indications for colonoscopy were rectal bleeding (18%), anaemia (5%); weight loss (3%); abdominal pain (12%); change of bowel habits (7%), screening or surveillance (55%). Demographic and clinical features of the two populations are reported in Table 1.

As expected, the presence of at least one comorbidity and concomitant medication intake was significantly higher in hospitalized patients than in outpatients (75.5% vs. 56.7% and 75.8% vs. 61.8%; $p < 0.001$).

Overall, suboptimal cleansing (graded as adequate, BBPS score 3–5) was recorded in 35.1% of cases at the level of proximal colon and 22.9% at the level of left colon. An incomplete colonoscopy, aborted because of inadequate cleansing (graded as poor, BBPS score $\leq$2) was recorded in 369 patients (11.2%), and in almost 50% of them it was due to poor cleansing of the proximal colon.

When comparing data in bowel cleansing rates between inpatients and outpatients, there were no significant differences between the two groups in both colonic segments; 76.5% and 77.4% of preparations at the level of left colon were rated good/excellent for inpatients and outpatients respectively ($p = 0.578$), while 63.2% and 65.6% of preparations were rated good/excellent at the level of proximal colon ($p = 0.178$).

At logistic regression analysis independent predictors of poor bowel preparation, either at level of left colon or right colon or