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COMPARATIVE STUDY ON FACTORS AFFECTING THE OPERATION PROCEDURE OF ENTEROSCOPY

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Abstract:

Objective *To make comparison between age, time, sex, diagnoses and bowl preparation techniques on the procedure of enteroscopic examination.*

Design *Comparative study*

Setting *Between November 2018 and May 2019*

Participants *430 patients from 20 years~90 years of age who underwent a colonoscopic examination with a confirmed presence of a gastrointestinal disease or condition. All patients were adequately prepped before the actual colonoscopy with whole bowel irrigation using polyethylene glycol and electrolyte solution,*

Results: *430 patients with recorded diagnoses were identified and were grouped according to age, sex, time taken for endoscopic examination and diagnoses. Chronic colitis and polyps were the two leading diagnoses confirmed during the exam besides other intestinal disorders. Patients above 20 years of age were found to have steadily increased rate of positive diagnosis for chronic colitis and polyps. However the risk was greatest for the age groups of above 40years of age. the average examination time for both young adults (20~30years) middles aged patients (30~40) was about 18minutes, which is less as compared to the patients of age groups above 40 years of age. This time steadily increased for patients above 40 years i.e. up to27 in elderly patients (80~90 years). Gender did not influence the time or method of examination.*

Conclusions: *Overall these results suggest that patients above 40 years of age are at a much higher risk of intestinal diseases and should be screened regularly and possible early in their lives as a means to take preventive measures. Further technological developments and future research studies in bowel preparation techniques will aid reduce the average time taken for endoscopic examination for all patients.*

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INTRODUCTION:

Colonoscopy is the endoscopic examination of the whole colon and the distal part of the small intestine with a fiber optic camera attached to the end of a flexible tube passed via anus; this enables gastroenterologists to visually examine lumen of colon and distal part of small intestine. [1]. Colonoscopy is an effective method used in diagnoses of ulcerations, diverticulosis, polyps, colon cancers, bleeding, inflammatory bowl diseases, chronic colitis, ulcerative colitis, crohns disease, hemorrhoids, fistulas, change in bowl habits and obstruction. It is also used for assisting therapeutic procedures such as control of bleeding or removal of polyps and biopsy of suspected lesions.
According to the new American guidelines, Colonoscopy is the preferred method for screening asymptomatic people for Colorectal Cancer [2]. Colorectal cancer (CRC) is one of the leading causes of malignant neoplasm-related mortality [3]. Despite the surge of newer CRC screening tests, colonoscopy has continued to be the gold standard. It is not only a screening modality but also a diagnostic and interventional tool. Vijan et al [4]

METHOD:

To perform colonoscopy effectively, the colon should be clean and free of any solid matter and the patient is put on a special restricted food diet i.e. low fibers and clear fluids only for one to three days prior to the procedure.
All colonoscopies were performed with an Olympus endoscope.The day before the Colonoscopy, whole bowel irrigation is performed using a solution of polyethylene glycol and electrolytes. Alternatively, the patient is administered a laxative preparation such as Bisacodyl, Phospho Soda, Sodium Picosulfate, Sodium Phosphate or Magnesium Citrate. Poor or inadequate preparation of bowel for colonoscopy can result in missed diagnoses and or cancellation of the procedure altogether. [5]

The time needed to perform colonoscopy depends on the type of patient as well as the experience and preparation of the endoscopist. Generally, the amount of time it takes for the physician to get all the way through the entire colon, cecal intubation and distal part of the small intestine depends on many factors including but not limited to: patient's discomfort level, reinsertion failure, bowl preparation, angulations among the large colon, abdominal surgery, peritonitis, age gender and types of interventions e.g. polyp removal, mucosal biopsy etc.

However there is limited data available regarding how these factors impact incubation time and to what extent [6].

Study design

I have randomly selected 430 patients, from the gastroenterology department of Suzhou University affiliated hospital No. 1, and collected their data; the patients underwent a colonoscopy between the time period of November 2018 and May 2019.

Exclusion criteria

Patients with no abnormal findings and inadequate bowl preparation were excluded.

Inclusion Criteria

Patients whose total procedure time (TPT) falls between 5~60minutes and present with abnormal findings such as Polyps ,IBD, Chronic colitis, Ulcerative colitis, Crohns disease, Proctitis, Fistula, Hemorrhoids, Colon cancer, hemostsia, Melanosis coli, Diverticulum, Sub-mucosal eminence of colon.

Study method

I have evaluated my data on the basis of three categories which are: time and diagnoses; age and diagnoses and conditions of bowl preparation.

The American Society of Gastrointestinal Endoscopy recommends a minimum withdrawal time of 6 minutes in screening colonoscopy with negative findings to assure the quality of procedure. [7]

I selected the total procedure time (TPT) of colonoscopy from 5~60 minutes. and then divide the time in further sub groups with the time interval of 5 minutes each e.g. 5~10 minutes 10~15minutes)and what diagnoses were made in this interval of time and the number of the diagnoses fall in this period and total number of patients whose colonoscopy procedure finished in this selected time and get the percentage.

RESULTS:

Time and Diagnoses

Time taken :5~10 minutes			
Diagnoses	**number**	**total patients**	**percentage**
polyps	3	22	13.6%
hemorrhoids	1	22	4.5%
colo rectal cancer	1	22	4.5%
chronic colitis	17	22	77.3%

22 patients finished their colonoscopy in 5~10 minutes, three of them diagnosed with polyps, one hemorrhoids, one has colorectal cancer and 17 patients diagnosed with chronic colitis

Time taken :10~15 mins			
Diagnoses	**number**	**total patient**	**percentage**
chronic colitis	55	83	66.3%
ischemic bowl disease	1	83	1.2%
polyp	23	83	27.7%
hemorrhoid	3	83	3.6%
diverticulum	2	83	2.4%
cecal diverticulum	1	83	1.2%
ulcerative colitis	1	83	1.2%
inflamation of ileo cecal valve	1	83	1.2%
colon leisons	1	83	1.2%
proctitis	1	83	1.2%

83 patients finished their colonoscopy in 10~15 minutes,number of diagnoses are chronic colitis 55,ischemic bowl disease 1,polyp 23,hemorrhoids 3,diverticulum 2,cecal diverticulum 1,ulcerative colitis 1,inflammation of leo cecal valve 1,colon leisons 1,proctitis 1.

Time taken :15~20 mins			
Diagnoses	**number**	**total patient**	**Percentage**
inflamation of ileocecal valve	2	103	1.9%
chronic colitis	57	103	55.3%
polyps	34	103	33.0%
melanosis	2	103	1.9%
colorectal cancer	2	103	1.9%
colon stricture	1	103	1.0%
proctitis	4	103	3.9%
ulcerative colitis	1	103	1.0%
cecal diverticulum	2	103	1.9%
rectal leison	1	103	1.0%
terminal ilium ulcer	1	103	1.0%
fistula	1	103	1.0%

103 patients finished their colonoscopy in 15~20 minutes,chronic colitis 57,polyps 34,proctitis 4,inflammation of ileocecal valve 2,melanosis 2,colorectal cancer2,cecal diverticulum 2,,colon stricture 1,ulcerative colitis 1,termina ileum ulcer 1and fistula 1.

Time taken :20~25 mins			
Diagnoses	**number**	**total patient**	**percentage**
chronic colitis	29	53	54.7%
polyps	24	53	45.3%
melanosis	1	53	1.9%
colorectal cancer	1	53	1.9%
diverticulum	2	53	3.8%
terminal ileum ulcer	1	53	1.9%

53 patients finished their colonoscopy in 20~25 minutes.chronic colitis 29,polyps 24,diverticulum 2,melanosis 1,colorectal cancer 1 and terminal ileum ulcer 1.

Time taken :25~30 mins			
Diagnoses	**number**	**total patient**	**percentage**
chronic colitis	18	43	41.9%
polyps	24	43	55.8%
colorectal cancer	4	43	9.3%
terminal ileum ulcer	1	43	2.3%
hemostasia	1	43	2.3%
sigmoid colon protuberant lesion	1	43	2.3%

43 patients finished their colonoscopy in 25~30 minutes.polypse 24, chronic colitis 18, colo rectal cancer 4, and hemostasia 1and sigmoid colon protuberant lesion

30~35 mins			
Diagnoses	**number**	**total patient**	**Percentage**
polyps	19	28	67.9%
chronic colitis	10	28	35.7%
submucosal eminence of colon	2	28	7.1%
proctitis	1	28	3.6%

28 patients finished their colonoscopy in 30~35 minutes.polyps 19,chronic colitis 10,submucosal eminence of colon 2 and proctitis 1.

35~40 mins			
Diagnoses	**number**	**total patient**	**Percentage**
asendingcolon leison	1	11	9.1%
colorectal cancer	1	11	9.1%
polyps	9	11	81.8%
chronic colitis	2	11	18.2%
diverticulum	1	11	9.1%

11 patients finished their colonoscopy in 35~45 minutes.polyps 9,chronic colitis 2,diverticulum 1,colorectal cancer 1and ascending colon lesion 1.

Time taken :40~45 minutes			
Diagnoses	**number**	**total patient**	**percentage**
polyps	7	7	100.0%

7 patients finished their colonoscopy in 40~45 minutes,polyps 7.

Time taken :45~50 mins			
Diagnoses	**number**	**total patient**	**Percentage**
polyp	4	5	80.0%
melanosis coli	1	5	20.0%
colorectal cancer	1	5	20.0%
sigmoid ulcer	1	5	20.0%
chronic colitis	1	5	20.0%

5 patients finished their colonoscopy in 45~50 minutes.polyps 4, melanosis coli 1, colorectal cancer 1, and sigmoid ulcer 1and chronic colitis 1.

Time taken :50~55 mins			
Diagnoses	**number**	**total patient**	**Percentage**
chronic colitis	2	5	40.0%
polyp	4	5	80.0%
ulcerative proctitis	1	5	20.0%

5 patients finished their colonoscopy in 50~55 minutes.polyps 4, chronic colitis 2 and ulcerative proctitis.

Time taken :55~60 mins			
Diagnoses	**number**	**total patient**	**Percentage**
Rectofistula	1	1	100.0%

1patients finished their colonoscopy in 55~60 minutes.rectofistula 1.

Age and Diagnoses

	20~25 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
terminal ileum ulcer	1	9	11.1%
chronic colititis	6	9	66.7%
Polyps	2	9	22.2%

	25~30 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	20	23	87.0%
ulcerative colitis	1	23	4.3%
Polyps	3	23	13.0%

	30~35 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	18	31	58.1%
polyp	11	31	35.5%
melanosis coli	1	31	3.2%
ulcerative proctitis	2	31	6.5%
hemorrhoid	1	31	3.2%

	35~40 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	15	28	53.6%
polyp	8	28	28.6%
hemorrhoids	2	28	7.1%
proctitis	2	28	7.1%
terminal ileum ulcer	1	28	3.6%
diverticulitis	1	28	3.6%

	40~45 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	16	25	64.0%
polyp	8	25	32.0%
colorectal cancer	1	25	4.0%
terminal ileum ulcer	1	25	4.0%
diverticulum	1	25	4.0%

	45~50 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	29	58	50.0%
polyp	32	58	55.2%
submucosal eminence of colon	2	58	3.4%
hemorrhoids	1	58	1.7%
diverticulitis	1	58	1.7%

	50~55 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	28	51	54.9%
colorectal cancer	1	51	2.0%
polyp	26	51	51.0%
proctitis	1	51	2.0%
cecal diverticulum	1	51	2.0%
hemorrhoids	1	51	2.0%

	55~60 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	17	35	48.6%
polyps	19	35	54.3%
hemorrhoids	1	35	2.9%
diverticulum	2	35	5.7%
colorectal cancer	1	35	2.9%

	60~65 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
colorectal cancer	4	46	8.7%
chronic colitis	18	46	39.1%
Polyp	21	46	45.7%
ischemic bowl disease	1	46	2.2%
recto fistula	1	46	2.2%
hemorrhoids	1	46	2.2%
ulcerative colitis	1	46	2.2%
cecal diverticulum	1	46	2.2%
Proctitis	1	46	2.2%
sigmoid ulcer	1	46	2.2%
	1	46	2.2%

	65~70 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
chronic colitis	17	30	56.7%
Polyps	14	30	46.7%
ulcerative colitis	2	30	6.7%
diverticulum	1	30	3.3%
colorectal cancer	2	30	6.7%
hemostasia	1	30	3.3%
Proctitis	1	30	3.3%

	70~75 years			
Diagnoses	**Number**	**Total patients**	**Percentage**	
chronic colitis	4	15	26.7%	
colorectal cancer	3	15	20.0%	
melanosis coli	2	15	13.3%	
colon leisons	1	15	6.7%	
diverticulitis	1	15	6.7%	
Polyp	7	15	46.7%	
	75~80 years			
Diagnoses	Number	Total patients	Percentage	
colorectal cancer	1	3	33.3%	
chronic colitis	2	3	66.7%	

	80~85 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
colorectal cancer	1	2	50.0%
rectal fistula	1	2	50.0%

	85~90 years		
Diagnoses	**Number**	**Total patients**	**Percentage**
Polyp	1	1	100.0%
sigmoid colon protuberant leison	1	1	100.0%

Age and Time:
There were 9 patient of age between 20~25. 25 patient of age between 25~30, 29patient of age between30~35, 35patient of age between35~40,26patient of age between40~45,57patient of age between45~50,51patient of age between 50~55,35 patient of age between55~60,51 patient of age 60~65,29 patients of age 65~70,14 patient of age 70~75,4 patient of age 75~80,2 patient of age 80~85,1 patient age between 85~90 years.

Average time taken for each group							
Age group (years)	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**
Average time (minutes)	18.4	18.34	1819/83=21.92	1877/86=21.83	1942/80=24.28	339/18=18.8	81/3=27

According to above table age and TPT in younger patients is shorter as compared to old patients and patients with past medical history of abdomen surgery don't show any significant relation. Age did not show any difference in cecal intubation rate. There is mixed evidence in relation to age and time and the difficult colonoscopy [8].

Gender
Out of 430 patients 177 female and 253 are male patients,by logistic regression analysis, age and gender did not show any difference in cecal intubation rate.There is mixed evidence in relation to sex and difficult colonoscopy. Women have a longer colon with a higher tendency to dip into the pelvis and a smaller abdominal cavity; thus, creating more looping, making it harder to navigate through the colon to reach the cecum[9].

Bowl preparation scale
We used the following bowel preparation scale: excellent (no or minimal solid stool and only small amount of clear fluid), good (no or minimal solid stool with large amount of clear fluid), fair (large amount of yellow water with semisolid stool that are cleared with difficulty) and poor (small amount of yellow water more semisolid stool that cannot be effectively cleared), Inadequate (solid stool cant precede the procedure)[10].

7 bags of Polyethylene glycol electrolyte powder in 3000 ml water drink with in 2hours before 6hours of colonoscopy,30 ml simethicone/dmimithicone before 4hours of operatio(doing colonoscopy)after intake of this med no intake till the operation is done

Scale	Number of patients	Total number	Percentage
Excellent	142	430	33.0%
Good	198	430	46.0%
Fair	82	430	19.1%
Poor	8	430	1.9%
Inadequate	0	430	0.0%

142 patients of excellent bowl preparation, 198 patients have good bowl preparation, 82 patients have fair bowl preparation, 8 patients have poor bowl preparation and zero patient with inadequate bowl preparation.

DISCUSSION

This is one of the very few comparative studies conducted related to endoscopic examinations. Results of 430 randomly selected patients were selected to make comparison among the different factors that influence the outcome of an endoscopic examination. Relationships between: time and diagnoses, diagnoses and age, age and time, gender and time were recorded respectively. Determination of these relationships will further broaden our understanding of disease incidence, disease control, early diagnosis, preventive measures to taken, improvement of endoscopic technique effectiveness. .

From the results obtained it is clear that, in China, the two leading abnormalities found during an endoscopic examination are chronic colitis and polyps; rest of the diseases account for a very small percentage of diagnoses.

Generally, on an average the procedure took about the same time for both chronic colitis and polyps, however polyps did present to be a high end challenge in regards to increased demand for time during the examinations. From 35~60 minutes, the percentage of polyps diagnosed was between 80-100%. This suggests the need for further research for the sake of improving enteroscopic techniques especially with regards to polyp findings. Reduction in the time taken for endoscopic examination for chronic colitis and polyps will be another step towards medical advancement; it will be financially more efficient for the hospitals and other institutions alike.

The American cancer society recommends that both men and women undergo a colonoscopy every 10 years, beginning at age of 50.if you have a family history colon cancer or other genetic risk factors screening may start earlier [11].most guidelines recommend screening stop between age 75 and 85. [12]

With regards to age and diagnosis, percentage of patients for positive findings started high as early as 20~25years of age group of 66% of the patients diagnosed with chronic colitis as compared to 22% with polyps. From 20~80 age group, colitis remains the leading diagnosis between 45~66% of patients confirming the diagnosis during enteroscopic examination. On the other hand findings for polyps show a steady rise in individuals of 25~40years of age. Later on, 40 years of age onwards, polyps compete with chronic colitis as the ratio approaches almost 1:1 i.e. nearly 50% of patients are either diagnosed with chronic colitis or polyps during the examination. This is a very important finding as this is in line with the above statement, [12]. There is a greater need for colonoscopic screening and its frequency above the age of 50. However this study suggests that maybe this age limit should start much earlier as to enable both patients and physicians to take the best preventive measures sooner rather than later.

Comparison between patients' age group and average time did yield a few differences in itself relative to patients' age groups. It should be noted that the average examination time for both young adults (20~30years) middles aged patients (30~40) was more or less the same i.e. ~18minutes, which is less as compared to the patients of age groups above 40 years of age. The average endoscopic examination time steadily increased for patients above 40 years of age reaching up to around 27 minutes for the most elderly patients (80~90 years). However patients of age group (70~80 years), average time approximately 18 minutes, did not follow the expected trend of steady increase in examination time. This decreased examination time is suggestive of an anomaly in the obtained result which could be the result of human error. Overall these results suggest that patients above 40 years of age are at a much higher risk of intestinal diseases and should be screened regularly and possible early in their lives as a means to take preventive measures.

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