

## Ileosigmoid knotting in the elderly: Outcomes of 32 cases over 44.5 years

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### ABSTRACT

**Objective:** Ileosigmoid knotting (ISK), in which the ileum wraps around the base of the sigmoid colon, is a rare cause of intestinal obstruction. This study aimed to compare the clinical outcomes of ISK in elderly and nonelderly patients.

**Methodology:** The clinical records of thirty two elderly patients, sixty years of age or older were reviewed retrospectively at the Department of General Surgery, Faculty of Medicine, Ataturk University from June 1966 to January 2011.

**Results:** The mean age of the elderly patients was 65.5 years, and 24 patients (75.0%) were male. Of the patients, 37.5% had recurrent volvulus, 31.3% had comorbid disease, 78.1% suffered from shock, and these rates were higher in the elderly group ( $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.01$ , respectively). Although the mean symptom duration was longer in the elderly group (51.3 hours vs. 43.5 hours,  $P < 0.01$ ), the clinical and radiological findings and the preoperative correct diagnosis rates were similar in the elderly and nonelderly groups ( $P > 0.05$ , in all). In addition to the types and the degrees of the torsion, bowel gangrene rate was also similar in both groups ( $P > 0.05$ , in all). Mortality and morbidity rates (34.4% vs. 10.3%,  $P < 0.05$ , in both) were higher in the elderly group. Similarly, hospitalization period was longer in the elderly patients (17.1 days vs. 12.2 days,  $P < 0.01$ ).

**Conclusion:** ISK is generally present with high percentages of recurrent volvulus, comorbidity, late admission, and shock in elderly patients. Although the clinical features and diagnostic modalities are similar, ISK has a graver prognosis in elderly patients.

**KEY WORDS:** Sigmoid colon, Ileum, Knotting, Elderly patient.

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### INTRODUCTION

Ileosigmoid knotting (ISK) is a rare cause of intestinal obstruction in which the ileum wraps around the base of the sigmoid colon and forms a pseudoknot.<sup>1</sup> The disease is an unusual entity in Western countries, but is comparatively common in African, Asian, Middle Eastern, Eastern and Northern European, and South American countries.<sup>2,3</sup>

As of 2009, more than 280 cases have been reported in the English literature.<sup>4</sup> ISK is more common in adult males, with the highest incidence in the 3<sup>rd</sup>-5<sup>th</sup> decades.<sup>5,6</sup> In the present article, we report the clinical results of a 44.5-year experience with 32 cases of elderly patients in Eastern Anatolia, Turkey, a region in which ISK is endemic. This is the largest series of ISK cases reported worldwide in an elderly population.

### METHODOLOGY

In this retrospective study, we reviewed the clinical records of 32 elderly patients 60 years of age and older with ISK who were treated at the Department of General Surgery, Faculty of Medicine, Ataturk University, over the 44.5-year period between June 1966 and January 2011.

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After a prompt and quick resuscitation, clinical examination, abdominal X-ray film, and CT or MRI for some patients were obtained. An emergency laparotomy was performed in all patients. In the retrospective clinical record analysis, the age, gender, comorbidities, previous volvulus attacks, symptom duration, clinical signs and symptoms, radiological findings, diagnosis, operative findings, treatment, mortality, morbidity and hospitalization period were noted.

In the statistical analysis, chi-square, Student's *t*-test and Fisher's exact tests were used. Differences were considered to be statistically significant for *p*-values of less than 0.05.

## RESULTS

Thirty-two elderly patients comprised 45.1% of the 71 total ISK patients. As seen in Table-I in which the patient characteristics are listed, the mean age was 65.5 years, and 24 patients (75.0%) were male in the elderly group, while the mean age was 30.7 years, and 28 patients (71.8%) were male in the nonelderly group.

Recurrent volvulus was present in 12 of the 32 elderly patients (37.5%) and in 6 of the 39 nonelderly patients (15.4%). Similarly, 10 patients (31.3%) had a comorbid disease (chronic obstructive pulmonary disease, hypertension, cardiac or coronary disease, or diabetes mellitus) in the elderly group, while 3 patients (7.7%) had a comorbid disease in the nonelderly group. The rate of recurrent volvulus was higher ( $P < 0.05$ ) and the rate of associated disease were significantly higher in the elderly patients ( $P < 0.01$ ) compared with the nonelderly patients.

The mean symptom duration was 51.3 hours in the elderly group and 43.5 hours in the nonelderly group; thus, the symptom period was significantly longer in the elderly patients ( $P < 0.01$ ). Similarly, when compared with the nonelderly group, a significantly higher rate of elderly patients (78.1% vs. 43.6%,  $P < 0.01$ ) suffered from toxic and/or hypovolemic shock. The most common symptoms were abdominal pain, distention, obstipation, and vomiting in both groups. The most common signs were abdominal tenderness and distention, while the other findings were abnormal bowel sounds (hypokinetic/akinetic or hyperkinetic), empty rectal vault, muscular defense, rebound tenderness, and rectal melanotic stool in the two groups. There were no statistically significant differences in the clinical features between the elderly and nonelderly groups ( $P > 0.05$ ). Plain upright or lateral decubitus abdominal X-ray films were evaluated in a total of 22 patients (68.8%), while

abdominal CT imaging was used in one patient (3.1%), and MRI was performed in one patient (3.1%). When ISK was surgically confirmed, the diagnostic value of the clinical features and the X-ray, CT, and MRI findings were similar in the two groups ( $P > 0.05$ ). Non-ISK misdiagnoses included obstructive emergencies (ileus, sigmoid volvulus, malignancy, intussusception, etc.) in 24 elderly patients (75.0%) and nonobstructive emergencies (peritonitis, intestinal ischemia, etc.) in 6 patients (18.8%).

In terms of the operative findings, the most common volvulus type was type 1 A (ileum revolved around the sigmoid colon in the clockwise direction), and the most common volvulus degree was 360° in both groups. The differences between the groups did not reach statistical significance ( $P > 0.05$  and  $P > 0.05$ , respectively). Bowel gangrene was identified in 27 elderly patients (84.4%) and in 31 nonelderly patients (79.5%), and there was no statistically significant difference between the groups ( $P > 0.05$ ). In gangrenous patients, resection with primary anastomosis or stoma for ileum and/or for sigmoid colon was performed. Nondefinitive surgical procedures, including sigmoid detorsion or sigmoid mesopexy, were applied in 5 elderly patients with a viable bowel (15.6%).

Eleven patients died in the elderly group, and the surgical mortality rate was statistically higher in this group (34.4% vs. 10.3%,  $P < 0.05$ ). Postoperative morbidity (paralytic or adhesive ileus and wound infection or dehiscence) was seen in 11 elderly patients, and the morbidity rate was statistically higher in the elderly group (34.4% vs. 10.3%,  $P < 0.05$ ). Similarly, the mean hospitalization period was significantly longer in the elderly group (17.1 vs. 12.2 days,  $P < 0.01$ ).

## DISCUSSION

Acute colonic volvulus accounts for 10%-30% of all large bowel obstructions, and sigmoid volvulus is the most common colonic volvulus form.<sup>7</sup> Although the incidence of ileosigmoid knotting (ISK) is not well known, it generally occurs in areas with a high incidence of sigmoid volvulus, and ISK accounts for 5%-50% of sigmoid volvulus cases.<sup>3,5</sup> ISK is predominantly seen in males with a mean age of 40 years (range, 2 weeks to 92 years).<sup>4,6</sup>

A high recurrent volvulus rate and a high serious associated disease rate are generally observed in ISK series.<sup>4,5</sup> These were seen in 37.5% and 31.3% of our elderly patients, and the rates were higher when compared with the nonelderly population. While the mean symptom period is between 18 to 46.6 hours

in the general population,<sup>1,2,5,8,9</sup> and 45.3 hours in children,<sup>10</sup> a prolonged symptom period with a mean of 51.3 hours was observed in the elderly group in the present study. In contrast, toxic and/or hypovolemic shock, which is seen in 28.6% to 60.3% of the general population<sup>1,2,5,8,11,12</sup> and in 33.3% of children<sup>10</sup> and is probably due to low tolerance, comorbidities, and late admission to the hospital,<sup>7</sup> was seen in 71.9% of our elderly patients, which was higher when compared with the nonelderly group.

ISK generally shows a sudden onset. The mean symptoms are abdominal pain, distention, obstipation, and vomiting, while the other complaints include nausea, diarrhea, anorexia, rectal bleeding, and hematemesis. The main signs of ISK are abdominal distention and tenderness, while the other findings include hypokinetic-akinetic or hyperkinetic bowel sounds, tympany, an empty rectum, visible peristalsis, an abdominal mass, and a fecal odor of the breath.<sup>1-6,8,9,11,13</sup> There are no specific blood tests for diagnosing ISK.<sup>3,6</sup> Abdominal plain or barium

contrast X-rays radiographs generally demonstrate a dilated sigmoid colon and/or multiple small intestinal air-fluid levels.<sup>2,3,5,6</sup> Radiologically, ISK is often mistaken for ileus or simple sigmoid volvulus.<sup>1,5</sup>

In an endoscopic examination, inserting the instrument is generally impossible because of the torsioned sigmoid segment, as seen in simple sigmoid volvulus.<sup>1,6</sup> ISK is often a diagnostic surprise to the operating surgeon, and a preoperative correct diagnosis is possible in 0% to 28% of the cases.<sup>1,4</sup> Although it was not possible to find a clinical study that compares the diagnostic parameters of elderly and nonelderly populations so as to compare our results with the literature, the present study did not introduce any diagnostic difference between the age groups. However, if the patient's condition allows for additional imaging, CT or MRI may be of greater diagnostic value<sup>7</sup> because they can show a dilated sigmoid colon with whirled sigmoid mesentery in addition to dilated small bowel segments with whirled small bowel mesenteries.<sup>14,15</sup>

Table-I: Characteristics of the patients with ileosigmoid knotting.

Characteristic	60 years of age and older	Under 60 years of age	Statistical analysis
Number	32/71 (45.1%)	39/71 (54.9%)	-
Age (Mean Years, Range)	65.5 (60-92)	30.7 (7-59)	-
Gender (Male/Female)	24/8 (75.0%/25.0%)	28/11 (71.8%/28.2%)	Chi-square test, $\chi^2 = 0.09$ , $P > 0.05$
Recurrent volvulus	12/32 (37.5%)	6/39 (15.4%)	Chi-square test, $\chi^2 = 4.5$ , $P < 0.05$
Associated disease	10/32 (31.3%)	3/39 (7.7%)	Chi-square test, $\chi^2 = 7.3$ , $P < 0.01$
Symptom duration (Mean Hours, Range)	51.3 $\pm$ 11.8 (12-120)	43.5 $\pm$ 10.9 (12-120)	Student's t test, $t = 4.1$ , $P < 0.01$
Toxic and/or hypovolemic shock	25/32 (78.1%)	17/39 (43.6%)	Chi-square test, $\chi^2 = 8.7$ , $P < 0.01$
Abdominal pain/tenderness	32/32 (100.0%)	39/39 (100.0%)	-
Obstipation	32/32 (100.0%)	38/39 (97.4%)	-
Distention	31/32 (96.9%)	37/39 (94.9%)	Fisher exact test, $P > 0.05$
Vomiting	27/32 (84.4%)	33/39 (84.6%)	Fisher exact test, $P > 0.05$
Hypokinetic/akinetic bowel sound	21/32 (65.6%)	25/39 (64.1%)	Chi-square test, $\chi^2 = 0.02$ , $P > 0.05$
Empty rectal vault	17/32 (53.1%)	23/39 (59.0%)	Chi-square test, $\chi^2 = 0.2$ , $P > 0.05$
Muscular defense/rebound tenderness	16/32 (50.0%)	20/39 (51.3%)	Chi-square test, $\chi^2 = 0.01$ , $P > 0.05$
Hyperkinetic bowel sound	8/32 (25.0%)	11/39 (28.2%)	Chi-square test, $\chi^2 = 0.09$ , $P > 0.05$
Melanotic stool	5/32 (15.6%)	6/39 (15.4%)	Fisher exact test, $P > 0.05$
Preoperative obstructive emergency diagnosis	24/32 (75.0%)	30/39 (76.9%)	Chi-square test, $\chi^2 = 0.04$ , $P > 0.05$
Preoperative nonobstructive emergency diagnosis	6/32 (18.8%)	8/39 (20.5%)	Chi-square test, $\chi^2 = 0.04$ , $P > 0.05$
Preoperative ISK diagnosis	2/2 (100.0%)	1/1 (100.0%)	-
Type 1 A	16/32 (50.0%)	18/39 (46.2%)	Chi-square test, $\chi^2 = 0.1$ , $P > 0.05$
Type 1 B	2/32 (6.3%)	3/39 (7.7%)	Fisher exact test, $P > 0.05$
Type 2 A	5/32 (15.6%)	6/39 (15.4%)	Fisher exact test, $P > 0.05$
Type 2 B	2/32 (6.3%)	3/39 (7.7%)	Fisher exact test, $P > 0.05$
Type 3 and unknown	7/32 (21.9%)	9/39 (23.1%)	Chi-square test, $\chi^2 = 0.02$ , $P > 0.05$
Volvulus degree 180°	1/32 (3.1%)	1/39 (2.6%)	Fisher exact test, $P > 0.05$
Volvulus degree 270°	2/32 (6.3%)	3/39 (7.7%)	Fisher exact test, $P > 0.05$
Volvulus degree 360°	17/32 (53.1%)	21/39 (53.8%)	Chi-square test, $\chi^2 = 0.0$ , $P > 0.05$
Volvulus degree >360°	5/32 (15.6%)	6/39 (15.4%)	Fisher exact test, $P > 0.05$
Unknown	7/32 (21.9%)	8/39 (20.5%)	Chi-square test, $\chi^2 = 0.02$ , $P > 0.05$
Bowel gangrene	27/32 (84.4%)	31/39 (79.5%)	Chi-square test, $\chi^2 = 0.3$ , $P > 0.05$
Mortality	11/32 (34.4%)	4/39 (10.3%)	Chi-square test, $\chi^2 = 6.1$ , $P < 0.05$
Morbidity	11/32 (34.4%)	4/39 (10.3%)	Chi-square test, $\chi^2 = 6.1$ , $P < 0.05$
Hospitalization period (Mean Days, Range)	17.1 $\pm$ 5.8 (8-23)	12.2 $\pm$ 4.9 (6-18)	Student's t test, $t = 3.7$ , $P < 0.01$

According to the classification developed by Alver et al.,<sup>2</sup> which was based upon anatomicopathologic findings, the most common volvulus type was type 1 A (ileum revolved around the sigmoid colon in the clockwise direction) in the elderly and nonelderly groups of the present study, and these findings were compatible with the published literature.<sup>2,4,5</sup> However, in another classification system that used preoperative and operative criteria that are correlated with mortality, advanced age (60 years and older) was admitted as a risk factor.<sup>16</sup> On the other hand, the most common volvulus degree was 360° in both groups of this series, and these findings are comparable with previous studies.<sup>2,4,5</sup>

In ISK patients, emergency surgery should not be delayed after an early and effective resuscitation.<sup>2,3,6,8-13</sup> In 73.5% to 79.4% of the cases, gangrenous bowel is encountered,<sup>1,2,4,5,9,13</sup> which was seen in 84.8% of our elderly patients. This percentage was statistically similar to that of the nonelderly population, while in 52.9% to 60.3% of the cases, both the small intestine and the sigmoid colon are found to be gangrenous.<sup>2,4,5,9</sup> Although there is considerable controversy regarding the preferred surgical procedure, in gangrenous ISK cases, all gangrenous small bowel segments are resected and bowel continuity is restored by an enteroenterostomy; similarly, a gangrenous sigmoid colon is resected and a primary anastomosis is used if the patient is stable and a tension-free anastomosis is possible. Despite the high morbidity, a stoma may be life-threatening, particularly in unstable cases or in cases with borderline ischemic bowel.<sup>1-6,8,9,11-13,16</sup> Moreover, in nongangrenous ISK cases, despite high sigmoid volvulus recurrence, careful untying of the knot may be used as the sole surgical procedure in stable patients, or a volvulus-preventing procedure such as sigmoid mesopexy, sigmoid mesoplasty or sigmoid resection with primary anastomosis may be added.<sup>1-5,8,9,11-13,16</sup> Although advanced age is not admitted as an impressive factor alone, it may alter the surgical planning when it is accompanied with the other risk factors such as associated disease, shock and bowel gangrene.<sup>16</sup>

ISK has a grave prognosis, and overall mortality has been reported to be 6.8% to 8% in nongangrenous cases and 20% to 100% in gangrenous cases.<sup>1-6,9,11-13,16</sup> In the present study, the mortality has been reported to be higher in the elderly group when compared with the nonelderly group (34.4% vs. 10.3%), and advanced age has been cited as a causative factor in increasing mortality, a finding that was compatible with the published literature.<sup>1,2,4,5,11,16</sup> Moreover, the morbidity has been reported to be 23% to 57.1%,<sup>1,5</sup>

and advancing age increases morbidity, as was the case in our study. The mean hospitalization period has been found to be 14 days in the general population,<sup>1</sup> which was comparable with our findings, and advanced age prolonged the hospitalization period in the present study.

In summary, in addition to a high recurrent volvulus rate and a high serious associated disease rate, a high toxic and/or hypovolemic shock rate was generally observed in elderly patients with ISK. Although a prolonged symptom period was characteristic, the clinical and radiological appearance of the elderly ISK patients was similar to that of the nonelderly patients. The preoperative correct diagnosis of ISK is difficult; CT or MRI may assist in making an accurate diagnosis. After an early and effective resuscitation, emergency surgery is essential in the treatment of ISK. The operative findings of the elderly ISK patients were also similar to those of the nonelderly patients. In terms of a surgical procedure, resection with primary anastomosis or stoma is advocated in gangrenous patients, while detorsion or additionally a volvulus-preventing procedure is recommended in nongangrenous patients. Advanced age is generally not admitted as an impressive factor alone in the surgical planning. ISK has a grave prognosis with high morbidity and mortality rates in elderly patients, and advanced age prolongs the hospitalization period.

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