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Idiopathic adult intussusception and a report of a case of idiopathic ileocecal and colocolic intussusception in an adult related to a rough airplane ride

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IDIOPATHIC ADULT INTUSSUSCEPTION
and
A Report of a Case of Idiopathic
Ileocecal and Colocolic Intussusception
in an Adult Related to a Rough
Airplane Ride

A Thesis
Presented to the Faculty of
the College of Medicine of the University of Nebraska
in Partial Fulfillment of Requirements
for the Degree of Doctor of Medicine

by

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under the supervision of Dr. Robert H. Westfall

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INTRODUCTION

Idiopathic adult intussusception has been infrequently reported in the literature and is rarely considered in the differential diagnosis of abdominal symptoms. Intussusception is described by Treves as the "prolapse of one part of the intestine into the lumen of an immediately adjoining part". It may occur anywhere from the esophagus to the anus, and it is generally considered to be a type of intestinal obstruction. Ninety to ninety-five per cent of cases appear in children where it ranks second to appendicitis as the most common acute abdominal condition after the first month of life. It is the most frequent cause of intestinal obstruction in children. About ten per cent of the cases of adult intussusception are idiopathic, and all of these cases occurred in the small intestine and ileocecal region. Idiopathic intussusception has not been previously reported as a cause of intussusception of the colon.¹ I became interested in this subject after discovering an unusual case of adult ileocolic and colocolic intussusception that occurred following abdominal trauma. The trauma consisted of passing through a tornado during an airplane ride from New York to Omaha with the patient's seat belt fastened during the rough part of the trip. Since I knew little about this subject, I decided to present as my senior thesis this case report with a discussion of adult intussusception.

CASE REPORT

The patient was a twenty-nine year old Caucasian female who presented with right lower quadrant pain of five days duration. She noted severe cramping abdominal pain and rectal bleeding of one days duration. She felt well until five days prior to admission when she first noted the onset of dull aching pain in her right lower quadrant which was aggravated by walking or jarring her abdomen. She obtained some relief with Darvon. She noted some loss of appetite but had normal bowel habits. She had no urinary symptoms. She failed to improve over the next two days and Darvon no longer relieved her pain. She consulted a physician at her New York hotel and received Empirin with codeine. Her symptoms continued unchanged and the patient flew home from New York to Omaha. The plane ran into a tornado on the trip causing her to have an extremely rough ride with her seat belt fastened. She, a former air line stewardess, and her husband, a former Air Force pilot, said that they had never experienced such a rough airplane ride. After arriving in Omaha the patient felt severe upper abdominal and lower abdominal cramping pain. She passed several stools containing bright red blood. Between cramps she had a dull aching pain in her right lower quadrant. She had nausea and vomiting associated with the onset of the crampy pain. Her gynecological history was not remarkable.

Physical examination revealed a well-developed, well-nourished white female in apparent acute distress. Her temperature was 98.6 orally, pulse 76, and blood pressure 110/70. Skin had good turgor. Mucus membranes were moist. The lungs were clear to auscultation and percussion. The heart had a regular rhythm. There were no murmurs. The abdomen was not distended. There was tenderness with some guarding in the right lower quadrant. There was also marked tenderness over the suprapubic area. The liver, spleen, and kidneys were not palpable. Pelvic examination showed right lower quadrant tenderness and a tender mass in the right lower quadrant. Rectal examination showed marked tenderness in the cul-de-sac and the presence of a soft tender mass. The neurologic examination was within normal limits.

The hemoglobin was 15 grams and the red blood count was 4.77 million. White blood count was 10,450 with 65% segs, 2%stabs, 24% lymphs, and 9% monos. The urine was yellow and hazy with an alkaline pH. There was no sugar or protein. There were no blood cells, but many epithelial cells, mucus threads, and amorphous phosphate crystals. A urine culture showed no growth. Flat and upright films of the abdomen revealed no free abdominal air and a minimal degree of ileus with no evidence of a mechanical obstruction.

Surgical and gynecological consultations were obtained. The patient was thought to have acute appendicitis and or

a ruptured ovarian cyst. An operation was then performed later in the day. At operation there was a large amount of free blood in the lower abdomen and the cul-de-sac. There was a ruptured corpus luteum cyst containing a large clot on the right ovary that was adherent to the posterior aspect of the fundus of the uterus. This was excised. The left tube and ovary were normal. There was an ileocecal intussusception of the ascending colon extending just distal to the hepatic flexure. The intussusception was manually reduced and then a colocolic intussusception of the proximal transverse colon was found. This was manually reduced also. The terminal ileum, ascending colon, and transverse colon were carefully palpated for the presence of an intramural mass or polypoid lesion and none were found. The bowel was not opened. There was a vascular band extending across the anterior aspect of the ileocecal valve. This was ligated and divided. The entire ascending colon was free with no attachment to the posterior abdominal wall. Appendectomy was then performed and the appendix was felt to be normal. The gall bladder, small bowel, and the remainder of the colon were not abnormal. The left kidney was found to be atrophic. The patient made an uneventful recovery and has remained asymptomatic to date.

REVIEW OF LITERATURE

HISTORY

Intussusception was one of the first specific causes of intestinal obstruction to be recognized. Its treatment with insufflation and enemas was described by Hippocrates in the Fourth Century B.C.. Abdominal exploration for its correction was proposed by Praxagoras around 300 B.C.. In the Eighteenth Century, John Hunter the anatomist read a paper before the Society for the Improvement of Medical and Chirurgical Knowledge entitled "Introssusception" and gave a description of the mechanism and anatomy of the physiologic process that is accurate to the present day.² Since this time there have been further descriptions of the physiologic process of intussusception and many theories proposed to explain the etiology.

INCIDENCE

It has not been possible to determine the overall incidence of intussusception due to the small number of cases in any series. However the incidence has been computed in relation to the total medical and surgical admissions to various hospitals. Burmeister in his series found an incidence of 0.25 and 0.36 cases per 1000 hospital admissions at Firmin Desloge and St. Mary's Hospitals in St. Louis respectively.³ In contrast there were 2.2 cases per 1000 admissions during the same ten year period on

the St. Louis University pediatric service. He found no age or sex difference and a twenty-four per cent incidence of primary intussusception. Bosworth and Stein recorded an incidence of three per 100,000 hospital admissions and Deterling et al an incidence of ninety-four per 100,000 hospital admissions.³

Iason stated that five per cent of all intussusceptions occur in the adult.³ Bosworth and Stein report an incidence of eight to ten per cent which agrees with Martin and Dennis's report of ten per cent occurring in the adult.³

Dietrich and Lee reported seventeen patients with intussusception seen between June 1961 and May 1963.⁴ Twelve were males and five were females. Fifteen were over the age of two. Their overall incidence was one per 1600 hospital admissions.

Intussusception may be classified by location as gastro-gastric, gastroduodenal, enteric, ileocolic, ileocecal, appendicocecal, colocolic, and stomal. The combined series of Donnhauser and Kelly⁵ and of Brayton and Norris⁶ give an incidence of thirty-nine per cent of all intussusceptions as enteric, thirteen per cent ileocolic, sixteen per cent ileocecal, seventeen per cent colocolic, and four per cent involving appendix and cecum only. The remaining eleven per cent involve the stomal types such as gastro-jejunoscopy, colostomy, and ileostomy. It is quite important to distinguish between ileocolic and ileocecal types because the causative lesion in ileocolic intussus-

ception is enteric in origin and is less likely to be malignant than in the ileocecal types where the lesion originates in the cecum and is more likely to be of malignant nature.

The series of recent years show progressively less frequent occurrence of primary intussusception. Donnhauser and Kelly in their series from 1900 to 1947 show 158 of 655 total cases to be primary intussusception for a twenty-four per cent overall incidence.⁵ Of eighty cases reported since 1947, only eleven per cent are listed as primary. Cotlar and Cohen report twelve per cent of their cases as being idiopathic in a recent series.⁷

Donnhauser and Kelly reviewed the English and American literature from 1900 to 1947 for causes of intestinal intussusception.⁵ Their series included 665 cases consisting of 401 males and 225 females. The incidence decreased markedly with advancing age. 158 were cases of primary intussusception with nineteen per cent including colocolic, appendicocecal, and cecocolic types and sixty-eight per cent including ileoileal, ileocecal, and ileocolic types.

From 1947 to 1952 134 cases of intussusception in the adult were reported in the British and American literature.⁸ Jejunogastric, colostomy, and ileostomy intussusceptions are excluded because it is believed that these are complications of their respective operations. The study only included cases involving patients of ten or more years of

age. The distribution of the 134 cases fell into the following groups: true idiopathic eighteen, Meckel's diverticulum seven, benign tumor forty-two, malignant tumor forty-nine, and other causes eighteen. A further breakdown of the idiopathic cases is as follows:

	Enteric	Ileocecal	Appendico- cecal	Sigmoido- rectal	Total
Number	8	3	1	4	16
Sex M	7	2	-	-	9
F	-	1	1	4	6
Ave. Age	44.7	44.7		57.5	

The Mayo Clinic reports ninety-six cases of intussusception occurring between 1910 and 1955 in patients fifteen years of age and older.⁹ In their series twelve and one half per cent were found to be idiopathic. Four were ileocecal and eight were enteric. In eighty-seven and one half per cent an organic lesion was found and sixty-nine per cent of these were malignant.

Ponka reported a demonstrable cause of intussusception in ninety per cent of his cases.¹⁰ He reports eighty-five males out of 123 patients for a sex distribution of 2.23 males to one female. The disease appeared to be more common in Australia and England than in the United States. The peak incidence occurred in adults in the fourth and fifth decades.

Brayton and Norris list thirty-five per cent of intus-

susceptions in their series as being due to benign tumors.⁶ Malignant tumors are second most common with twenty-one per cent frequency. Fifty-four per cent of intussusceptions of the colon were due to malignancy while only fifteen per cent of enteric intussusceptions were due to malignancy.

ETIOLOGY

There have been many different etiologies reported in the literature. These include benign and malignant intramural tumors and intraluminal growths, ulcers, gummas, healed gastric ulcers, hypertrophic gastric mucosa, chronic gastritis, chronic ulcerative colitis, megacolon, mobile cecum, strangulated cecal haustration, hypertrophied ileocecal valve, stoma, rectal prolapse, visceral prolapse, foreign body, long intestinal tube, parasites, peritonitis, diverticulitis, acute appendicitis, adhesions, congenital ileal band, trauma, enlarged mesenteric glands, submucous lipoma of the ileum, fasting, and intestinal ischemia from embolus.¹¹

Intussusception of the small intestine at autopsy may be single or multiple and is regarded as an agonal phenomenon.¹¹ This type of intussusception is usually retrograde and is not usually associated with any inflammatory changes.

In 1898 Nothnagel popularized the hypothesis of intussusception resulting from intestinal spasm.¹² This was

based on his experiments with faradic stimulation of the rabbit gut. He suggested that the contracted area was drawn into the gut distally and propelled like a bolus of food. In the patient this principle is a type of dysfunction of the autonomic nervous system. Parasympathetic hyperactivity or sympathetic hypoactivity would result in spasm of the intestine.

This mechanism might be used to explain ileocecal prolapse.¹³ Spasm of the ileum and inefficiency of the ileocecal valve could lead to prolapse of the ileocecal valve and ileocecal intussusception. Also an exaggeration of the normal projection of the ileocecal valve into the cecum when intestinal contents are discharged into the large bowel could play an etiologic role. This might also be explained by an anatomical variation in the fold of Treves consisting of a well-developed triangular curtain passing from the cecum to the antimesenteric border of the terminal ileum.¹⁴ This band usually contains a vessel on its free margin and holds the terminal ileum prolapsed into the cecum. This anatomical detail has not received much attention in the past and may be the cause of many previously recorded idiopathic intussusceptions.

Dietrich and Lee found a mobile cecum in ten of fourteen patients with subacute or chronic ileocecal intussusception.⁴ This mobility may protect the circulation of the bowel against occlusion since the vessels can be pulled along in the mesentery as the intussusception continues.

However a mobile cecum has been previously implicated as an etiologic agent in ileocecal and cecal intussusception.¹⁵ The mobility allows the cecum to prolapse into itself which would not be possible if its normal peritoneal attachment were present.

Autonomic nervous system dysfunction could be produced by drug ingestion. Joseph reports a case of a twenty year old asthmatic girl who during an acute attack of asthma drank seven milliliters of an asthmatic inhalant containing epinephrine, posterior pituitary extract, papaverine, atropine, hyoscine, and chlorbutol.¹⁶ The posterior pituitary extract produced spasm of the gastrointestinal tract and the others produced paralysis. The result was an intussusception of the jejunum.

Intestinal parasites have not been directly related to intussusception, but there have been instances where their presence may be a causative factor. Eight cases of chronic intussusception were reported from southwest Korea.¹⁷ Two patients were found to have *Endamoeba histolytica* in their stools and all but one had some type of intestinal parasite.

Cole reports an unusual type of cecocolic intussusception and attempts to correlate it with intestinal parasites and diet.¹⁸ In Ibadan, Nigeria cecocolic intussusception was the second most common abdominal emergency seen from 1958 to 1962. This condition was second in frequency only to strangulated hernia. It was without

organic cause and found to affect mostly people over five years of age but only Negroes. The starting point of the intussusception was always from an area of one square centimeter on the front of the cecum. Cole believes this is due to an abnormal physiologic response of normal tissue. These people ingest in their diet a large amount of 5-hydroxytryptamine which is a smooth muscle stimulant. One third of them are also infected with ascaris which excretes a smooth muscle stimulant. The intussusceptions tend to occur during feasts. Cole points out however that these substances are also found in other areas of the country where the disease is not prevalent and is restricted to only the Negro race so that diet and chemicals may not be the factors involved.

A possible etiology of intussusception in children and not at present linked with adult disease is adenovirus infection. Children hospitalized with intussusception are found to have had significantly less previous experience of adenovirus infection by serotypes 1, 2, 5, and 6 than children admitted to the hospital with other illnesses.¹⁹⁻²² These children must be considered as being susceptible to infection by these serotypes. This susceptibility forms the basis for the importance of adenovirus infection in the etiology of intussusception in children. The association with adenovirus has been found to be statistically significant. Most adenovirus disease occurs in the respiratory tract but it may multiply in

the lymphoid tissue of the small intestine. There is generally observed to be no localized swelling in mesenteric lymph nodes or Peyer's patches at operation. Adenovirus was cultured from mesenteric lymph nodes in nine of twenty-four cases of intussusception with none cultured from normal children. Adenovirus was also cultured from feces of fifteen of twenty-four cases of intussusception as compared with only one of forty-one controls. Throat swabs were positive in eleven of twenty-four intussusception cases compared with one of twenty controls.²¹ The precipitating factor may then be the hyperperistalsis resulting from the dietary disturbances of the first years of life or from the adenovirus infection itself.²⁰ This shows that adenovirus is present significantly more frequently in intussusception patients than controls. There may be other factors involved, but intussusception in children probably has a mixed etiology.²²

Nothnagel's experiment showed that intussusception can be produced by a derangement of the normal neuromuscular activity of the bowel. Arenson assumes that any etiologic factor which may produce a profound neuromuscular dysfunction can produce intussusception.²³ Some agents that could possibly do this are profound emotional and psychic disturbances.

In 1935 Watts observed contraction and intussusception in the small intestine of monkeys upon electrical stimulation of the brain in premotor area 7A.²⁴ This finding

was abolished by bilateral vagotomy. Three dogs in his series of frontal lobotomies died of intussusception and intestinal obstruction. He thought that reflex or traumatic alteration of the relative influence of the vagus nerve and sympathetic nerves controlling peristalsis could be predisposing to intussusception.

In this same area Foltz et al in a project on cerebral factors in experimental psychosomatic disease states of monkeys found intussusception suddenly causing death in four monkeys undergoing behavioral conditioning experiments designed to produce peptic ulceration.²⁵ All occurred in the ileum within twenty-five centimeters of the ileocecal valve. This finding was rarely found in autopsies on normal monkeys that died of other causes. Some workers produced intussusception by ablation of frontal area 6 and could block this by vagal nerve section. Gut motility has been experimentally related to cerebral areas especially the frontal lobes, cingulate gyrus, and the limbic lobe. It appears likely that the emotional stress produced the intussusceptions since all other factors could be eliminated by comparison with controls. This is not difficult to understand since diarrhea and gastrointestinal complaints occur in a similar manner due to hypermotility of the human gastrointestinal tract in an individual exposed to emotional stress.

There have been relatively few cases of intussusception related directly to trauma. Many cases appeared in

the older literature and were quite poorly reported, making an association with trauma unproven. There have been some interesting cases reported in the recent literature however.

Badertscher reports a case of a nine year old boy who was run over the abdomen by a truck.²⁶ He was found to have three separate idiopathic intussusceptions of the ileum at operation. He also reports a case by Stewart of a thirty year old male who was struck across the crest of the left ileum by a heavy beam and then began having symptoms of intestinal obstruction. At operation he was found to have an idiopathic intussusception of the small intestine. LeConte in 1898 treated a nine year old boy who had been stabbed in the abdomen.²⁷ Celiotomy revealed an idiopathic direct jejunal intussusception about one inch long. Two feet distal, two other idiopathic intussusceptions, one direct and the other retrograde were found. Each was about three-quarters of an inch long. These are all examples of multiple intussusceptions following abdominal trauma.

Leichenstein in 1873 reported 326 cases of intussusception in whom there was a thorough history.²⁷ Twenty-six had a definite history of trauma and the first symptoms usually followed the traumatic event directly. Fourteen of the cases were contusions of the abdomen. The remaining cases followed concussion or severe physical exertion. There were also cases where a sudden increase in intraabdominal pressure was believed to be the causative

agent.

Dixon reports four cases of post-traumatic intussusception occurring in adult males.²⁴ His first case was one of an eighteen year old who had an antegrade intussusception of the ileum following a gunshot wound to the colon. The second case was of a seventy-six year old who suffered a severe abdominal contusion following a truck accident. He was found to have a complete transection of his transverse colon and an antegrade jejunal intussusception. His third case was of a nineteen year old who had an ileal intussusception following a transorbital lobotomy. The last case was of a forty-three year old who suffered abdominal trauma in a trench cave-in and was found to have three separate idiopathic intussusceptions of the jejunum.

Cook reports a case of a seventeen year old male who suffered an ileocecal intussusception following a blow to the right lower quadrant during a boxing match.²⁸ At operation no causative lesion was found.

Multiple intussusception, retrograde intussusception, and traumatic intussusception are each a rarity. Falor presents a case of a soldier injured in combat in World War II.²⁷ He was injured in the left lumbar area by a fragment of an aerial bomb. He sustained a compound fracture of the left acetabulum and pubis, a severe laceration of the sigmoid colon, incomplete transection of the external iliac vein, and transection of the inferior epi-

gastric artery. These lesions were repaired at operation and the gastrointestinal tract was then explored. The patient was found to have a three and one half centimeter intussusception of the mid-jejunum. In the ileum there were three areas of contiguous direct and retrograde intussusceptions. These were reduced manually and the involved areas of intestine appeared normal. Falor held that trauma was the etiologic agent in this case. Nervous tension of the battle caused a violent central and adrenergic stimulation of the sympathetic nerves of the gastrointestinal tract with a resultant spasm of the sphincters and segmental spasm of the bowel. The abdominal wall blast could have been enough to drive spastic areas into adjacent dilated areas. This was the sole instance of intussusception in the author's review of 1063 cases of acute war wounds of the abdomen and chest. The soldier ate a meal of K of C rations just prior to his injury which could have acted as a gastrointestinal irritant and also been a predisposing factor. Falor suggests that the factors of a recently ingested meal, severe fright, and autonomic nerve imbalance in the soldier all acted together to produce intussusception. Trauma however was needed for the actual intussusception to occur.

SYMPTOMS

Intestinal intussusception is rarely considered in the differential diagnosis of gastrointestinal disease

in the adult. It may cause recurrent abdominal pain defying usual diagnostic efforts. It may be further classified as acute, subacute, or chronic depending on the duration of the clinical manifestations. This variation is due to the degree of looseness or tightness with which the intussusceptum is held by the intussusciens. The tighter it is held, the greater is the constriction of the mesentery and the more rapid is the production of necrosis resulting in acute symptoms. The fulminating acute disease is rarely seen in adults with most cases being of a subacute or chronic nature. In the infant these changes occur suddenly with resulting obstruction, tubular mass, signs of inflammation, and early metabolic changes occurring simultaneously. In the adult all stages of this syndrome may occur as a clear progression and along with the tendency to spontaneous remission may account for the greater variation in signs and symptoms. Arenson reports the radiologic diagnosis of a case of enteric intussusception that spontaneously reduced itself.²³ The history of the patient contained references to attacks of severe indigestion which may have been unrecognized intussusceptions with spontaneous recovery.

There is usually however a typical pattern. True colicky pain may come over a period of several years because of the tendency of the intussusception to reduce itself spontaneously. This fact may make the diagnosis elusive. The symptoms of intermittent abdominal cram-

ping pain and recurrent nausea and vomiting are suggestive of a partial bowel obstruction. There may be normal bowel habits or there may be diarrhea, constipation, or both alternately.

Burmeister demonstrated a clinical pattern in all cases with certain specific symptoms tending to become more prevalent in individual types.³ Symptoms of ileocecal intussusception ranged from three months to several years. Enteric intussusception produced recurrent attacks of abdominal pain for as long as twelve and thirty-one years in two patients. In all but one patient in his series a typical colicky pain pattern of partial intestinal obstruction occurred. Pain radiation was noted in eighty-three per cent of ileocecal and forty-three per cent of enteric intussusceptions. This pain was non-specific except in the ileocecal type which tended to move toward the right lower quadrant with each peristalsis. In eight of twelve patients with ileocecal intussusception there was an increase of pain shortly after the intake of food and occasionally water. Pain across the small of the back often accentuated with each peristalsis was common in the patients with enteric and ileocecal intussusceptions. A few patients had a true lack of appetite. Nausea, vomiting, bloating, constipation, and diarrhea were inconstant. Enteric intussusception produces predominately upper gastrointestinal symptoms such as nausea and vomiting with each attack. Colonic intussusception

produces lower gastrointestinal symptoms such as urgency, tenesmus, and diarrhea. A history of blood or mucus in the stool was common in colonic types but obtained in less than half of other types. At least a fifteen pound weight loss occurred in five of twelve patients with ileocecal intussusception and five of seven patients with enteric intussusception. These were all patients with a benign etiology. Exhaustion, fatigue, chills, and fever were rarely noted. In spite of these symptoms five of seven enteric, five of twelve ileocecal, and two of six colonic intussusceptions were diagnosed only by operation.

SIGNS

In Burmeister's series fever, tachycardia, and other constitutional signs were not prominent.³ An abdominal mass was present in sixty-six per cent of ileocecal, forty-three per cent of enteric, and thirty-three per cent of colonic intussusceptions. In the ileocecal and enteric types the mass changed rapidly or recurred. In several patients the mass hardened with each peristalsis. Abdominal tenderness and distension were often found in those with ileocecal intussusception but this occurred late in the clinical course. Rectal exam revealed a palpable mass in seventy per cent of colonic intussusceptions.

Brayton and Norris state that there is little evidence of peritoneal irritation since the necrotic bowel is en-

cased within adjacent bowel.⁶ For this same reason a mass, if palpable, is not very tender or tender only during peristaltic contraction. The mass is usually soft and movable. They found that seventy-seven per cent of children have a palpable mass while only forty-nine per cent of adults have a palpable abdominal mass. Sigmoidoscopic exam is only helpful in colonic intussusception or a large ileocecal intussusception.

Diagnostic studies are usually not helpful. A leukocytosis and left shift can not be counted on even with gangrenous bowel. There may be anemia associated with chronic enteric intussusception. Stools hematest positive in sixty-three per cent of ileocecal, eighty-three per cent of colonic, and forty per cent of enteric intussusceptions.

X-ray studies are of primary importance in the diagnosis. An enteric intussusception gives an abnormal small bowel gas pattern consisting of dilated loops of small bowel and a mass may be seen on a plain film of the abdomen. This may or may not be present with colonic intussusception. However Schatzki states that a flat film of the abdomen can give a positive diagnosis of intussusception. Barium swallow and barium enema may each give a diagnostic picture of intussusception. The barium swallow gives a "bird's beak" appearance to the distal barium column. The barium enema gives a "coiled-spring" appearance produced by the barium outlining the space between

the intussusceptum and the intussusciens. The barium enema is usually diagnostic of intussusception.²⁹

PATHOPHYSIOLOGY

The pathophysiologic process is the same in both children and adults. An intussusception consists of three layers of bowel. There is an inner entering layer, a middle returning layer, and an outer ensheathing layer. The receiving part is called the intussusciens and the invaginating part is called the intussusceptum. There may be a compound intussusception consisting of five to seven layers. The intussusception usually travels distal with the intussusciens consisting of bowel which is distal to the intussusceptum. This is also known as a direct or antegrade intussusception. Retrograde intussusception in which the intussusciens is the proximal piece of bowel may also occur but is quite rare. Even more rare is the case of contiguous direct and retrograde intussusception with a common intussusciens.

Intussusception produces a narrowing or obstruction of the lumen of the bowel. The serious consequences are due to the effects on the mesentery of the invaginated portion of bowel. As the process progresses, more and more of the mesentery is stretched and compressed between the layers. This produces obstruction of the veins and lymphatics and produces edema of the bowel wall. The edema further narrows the lumen and also produces extra-

vasation of blood and serum from the serosal and mucosal surfaces. Soon adhesions cover the outer surfaces and in combination with the swelling make reduction more difficult with the passage of each hour. If this process is allowed to continue for a long enough period which may be thirty-six hours or three days, the arterial supply is compromised and the bowel becomes gangrenous. In some cases the necrotic portion is sloughed and passed through the bowel and recovery of the patient results. Usually however without treatment perforation, peritonitis, and death soon occur.

An occasional intussusception may occur for days without producing extensive edema or necrosis of the bowel. This is called a chronic intussusception. These cases are associated with a long thin mesentery which is not so readily compressible.

DIAGNOSIS

The diagnosis is made by history, physical examination, and x-ray studies. The history may refer to recurrent attacks of colicky abdominal pain that may be associated with nausea or diarrhea, constipation or both. The pain has no specific location. An enteric intussusception is usually associated with upper gastrointestinal symptoms such as nausea and vomiting. The ileocecal and colonic types are associated with changes in bowel habits and there is likely to be a history of blood in the stools.

The physical examination is usually not remarkable. Abdominal tenderness tends to occur late in the clinical course. An abdominal mass may be present. The mass is usually not tender and may change in size and firmness.

Laboratory studies have proven to be unreliable in the diagnosis of intussusception. A leukocytosis may or may not be present. Anemia may be associated with a chronic enteric intussusception producing chronic blood loss.

X-ray studies will make the diagnosis in most cases if the disease is suspected. A small bowel gas pattern suggestive of partial obstruction is seen in many cases. A mass may be seen on a plain x-ray of the abdomen. Barium contrast studies will usually make the diagnosis of intussusception. Operation will confirm the diagnosis, but the diagnosis should be made before an operation is performed.

Intussusception occurs so infrequently that it is often overlooked in the differential diagnosis of the acute abdomen and the appropriate x-ray studies are not undertaken. The most important factor in making the diagnosis is simple awareness of this condition. It should be suspected with any acute abdominal condition especially if rectal bleeding is present.

TREATMENT

Historically treatment has lagged behind early des-

criptions of the mechanism of intussusception. In 1871 Hutchinson's reports directed surgeons' attention toward the surgical management of the condition.³⁰ In 1884 Treves described spontaneous cure after sloughing and passage of the gangrenous intussusceptum as the most common circumstance leading to recovery. His overall mortality rate of intussusception was about seventy per cent. Arthur E. J. Baker is credited with the first rational treatment of intussusception.² In 1888 Baker described an operation on a case of his own and urged early laparotomy as the treatment of choice. He believed that inflation and injection should be given a trial, but if these means were not successful, one must be prepared to open the abdomen at once. His views were reluctantly accepted by the medical profession. Opening the abdomen was considered a desperate last effort to be used only in hopeless cases. The objection was that there was a reasonable chance of cure without operation and surgically managed cases were considered medical curiosities.

According to Langstaff the first successful operation for intussusception was performed in France in 1784.³¹ Langstaff himself wrote that "the aid of medicine and surgery affords not the slightest prospect of benefit". He considered the operative mortality so high that the best chance of survival lay in the hope that spontaneous cure might occur by sloughing the invaginated portion of the bowel. By the turn of the century however the weight

of medical opinion had swung toward surgery.

In the adult surgery is mandatory because of the high frequency with which an associated neoplastic lesion is the etiologic agent.³ Since this is a type of intestinal obstruction most cases will ultimately require an operation. An enteric intussusception will require operation as the only way to relieve the obstruction. A colonic type however may be reduced by operation or by the use of enemas. This latter practice is not recommended in the adult however because although the enema reduces the intussusception it does not correct the underlying cause of intussusception.³² In the colon this etiology is usually a malignancy with the remainder of cases being a benign neoplasm. Operation is also indicated in cases of recurrent intussusception where there is a variation of normal anatomy that predisposes to intussusception. The aim of operation in these cases is to correct these anomalies or to change the anatomy so that intussusception is less likely to occur.

DISCUSSION

There has never been a case reported of intussusception related to a bumpy airplane ride. There has also never been a case reported of idiopathic intussusception of the transverse colon. I believe that this case is unique in these two respects. However it is evident that this case is not a clear-cut, straightforward case of intussusception. The coexisting ruptured corpus luteum cyst and free blood in the peritoneal cavity tend to obscure the onset and type of symptoms.

From the history it is not clear when the intussusception actually occurred. The patient noted the onset of pain five days prior to admission. I believe that this early pain was due to the ruptured corpus luteum cyst since at that time she had no nausea, vomiting, abdominal cramping or blood in her stools. These symptoms clearly began immediately following her plane ride and I believe that this was the initiating event. During this ride she was subjected to up and down jolting, direct abdominal trauma from her seat belt, and changes in atmospheric pressure. As discussed in the etiology, these factors have all been related to intussusception.

This is further reinforced by the fact that the intussusception was easily reduced. If the intussusception were five days old, it would have probably formed adhesions and been difficult or impossible to reduce. We

must also realize that adult intussusception tends to be subacute or chronic in nature and may cause little inflammation. If this were the case there would have been few adhesions. As was noted though, the patient had symptoms for only several days and I assume then that these intussusceptions were acute and that inflammatory changes did not have time to occur.

There were several other etiologic factors related to the production of this intussusception. The patient had a completely mobile cecum and right colon. This served to protect the bowel from infarction. It is also a possible etiologic factor because intussusception is more likely to occur if the bowel is not fixed to the abdominal wall. The patient also had a vascular band crossing the ileocecal junction. As was discussed, this band may cause prolapse of the ileum into the cecum and predispose to intussusception.

The colocolic intussusception of the transverse colon was observed to be separate from the ileocecal intussusception. It could have been caused by the presence of the ileocecal intussusception. I believe however that it was caused by the abdominal trauma. The bowel was not opened but the affected area was thoroughly and carefully palpated for lesions and no intrinsic lesion was found. This along with the fact that there has been no recurrence in this patient leads me to believe that no lesion was responsible for the intussusception. The ileo-

cecal intussusception could have been caused by the factors mentioned above, but I believe that it, too was caused by abdominal trauma.

The physical exam was not very helpful in the diagnosis of this patient. There was no definite palpable mass and the tenderness was confused with that of the right ovary. The one real diagnostic aid was the presence of blood in the stools as found in most colonic intussusceptions. Laboratory was not helpful. X-rays were not helpful either. The plain abdominal x-ray showed minimal ileus with no soft tissue mass. Barium contrast studies were not done.

The treatment was appropriate for the condition. This consisted of simple reduction of the intussusception and division of the ileocecal band. The patient was examined for the presence of a neoplastic lesion and none were found. The bowel was observed to be viable so a resection was not performed. The patient was made less prone to have a recurrence by the division of the vascular ileocecal band and possibly the formation of adhesions between the affected areas of colon and the abdominal wall.

SUMMARY

I have presented a case of idiopathic adult ileocolic and colocolic intussusception occurring during a rough plane ride. I have reviewed the literature for other cases of adult intussusception related to trauma. I found no previously reported cases of idiopathic intussusception of the transverse colon and no cases of intussusception following a plane ride.

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