THE POSITION OF THE LARGE INTESTINE IN INFANTS AND ITS RELATION TO CONSTIPATION

BY

A. K. ABDEL KHALIK, M.R.C.P., Assistant Physician; H. ERFAN, Diploma of Radiology, Radiologist; and A. ASKAR, House Officer.

(From the Children's Section, Qasr el Aini Hospital, Cairo.)

The work presented in this paper was undertaken, first, to ascertain the differences in shape and position of the large intestine in infants, especially of the iliac and sigmoid colons; and, secondly, to see if there is any real relation between any of these types and constipation in infants.

Anatomy.—A short account of the anatomical characters of the descending colon, iliac and sigmoid portions of the large intestine in adults will help much to the appreciation of the differences we came across in these portions of the large intestine in infants.

The descending colon passes downwards through the left hypochondriac and lumbar regions and in front of the lower part of the left kidney. At the lower end of the kidney, it turns medially towards the lateral border of the psoas major, and descends in the angle between the psoas major and quadratus lumborum muscles to the crest of the ilium; it then curves downwards and medially in front of the iliacus and psoas major, and ends in the sigmoid colon at the superior aperture of the lesser pelvis.

That portion of the descending colon which extends from the ilium to the superior aperture of the lesser pelvis is sometimes named the iliac colon.

The sigmoid colon, sometimes called the pelvic colon, begins at the superior aperture of the lesser pelvis where it is continuous with the descending colon; it forms a loop which averages about 20 cm. in length and normally lies within the pelvis. The loop consists of three parts. The first part descends in contact with the left pelvic wall; the second crosses the pelvic cavity between the rectum and bladder in the male, and the rectum and uterus in the female, and may come in contact with the right pelvic wall; the third arches backwards and reaches the mid-line at the level of the third piece of the sacrum where it bends downwards and ends in the rectum.

The position and shape of the sigmoid colon vary very much and depend on:—

(1) Its length.

(2) The length and freedom of its mesocolon.

- (3) The condition of distension: when distended it rises out of the pelvis into the abdominal cavity, and when empty it sinks again into the pelvis.
- (4) The condition of the rectum and bladder: when these organs are distended, the sigmoid colon tends to rise, and conversely (see Fig. 1).

In infants, conditions are entirely different. The descending colon is comparatively short, and is in contact with the left kidney and quadratus

FIG. 1.—X-ray picture of the large intestine in an adult after a barium enema.

lumborum muscle. The sigmoid colon is the most striking part of the large intestine in the newly-born. It is generally enormously distended with meconium, and as the lesser pelvic cavity is too small to contain any considerable part of it, it projects far upwards into the abdomen. The sigmoid colon may take a variety of forms for which several classifications have been suggested. Following that proposed by Bourcart, three main types can be recognized, the ascendant, the transverse and the descendant. The ascendant is by far the commonest, being found in 75 per cent. (Gysi) to 80 per cent. (Bourcart) of all cases. In this type, three intestinal loops are

formed. The first is small with its apex directed downwards and lies in the left iliac fossa, and passes over into the main loop which is directed upwards into the abdominal cavity and which may reach the level of the umbilicus or even higher. The descending limb of the main loop joins the small third loop which passes into the lesser pelvis. In the second type, the main loop of the sigmoid passes transversely across the lower part of the abdomen and its apex is lodged in the right iliac fossa. Twenty to twenty-five per cent. of sigmoid flexures are of this variety. In the third type which is quite unusual, the sigmoid passes directly over the left iliac fossa into the lesser pelvis. The main loop of the sigmoid colon is almost always in front of the small intestine and in contact with the anterior abdominal wall. In one half of all cases, a part of the sigmoid colon lies in the right iliac fossa (see Fig. 2).

FIG. 2.—The three main types of large intestine in infants diagrammatically after Bourcart.

The explanation of the preceding difference between the large intestine of infants and adults is found in the following words by Jacobi:—

1. The small intestine of the foetus of 8 months is twelve times as long as its trunk. In the adult it is 8 to 1.
2. The colon of a foetus at full term is $2\frac{2}{3}$ times that of the trunk. In the adult it is 2 to 1.

The ascending and transverse colons are very short in the foetus and newly-born. Thus, the descending colon which makes up the difference is longer in proportion, and while the whole intestinal tract grows but slowly in the young foetus, it increases rapidly in the mature foetus, but its rate of growth diminishes in proportion sometimes after birth. Meanwhile, the foetus grows but slowly in the later period of uterine gestation, and the long colon descends with the sigmoid flexure but finds no space for comfortable accommodation. Consequently, the long colon is crowded downwards in the narrow abdomen by the large liver into a narrow pelvis causing many curvatures instead of one sigmoid flexure. Thus it happens that instead of the sigmoid flexure being found to the left or in the median line, it is frequently found in the right side.

The preceding types of the large intestine in infants described by Bourcart have been confirmed by Bednar and Jacobi who were the first to use it for the explanation of congenital constipation in infants.

Present investigations.—Ninety-six normal and healthy children have been examined with the idea of determining the shape and position of their large intestine. The ages of these children lie between one month and three

years. Of these, 62 were in the first year, 25 between 1 and 2 years, and 9 above 2 years. Thirty-nine were females and 57 were males.

The method employed was to give a rectal enema of plain water one hour before the baby was screened. While under the screen, a 3 per cent. suspension of barium sulphate in water containing some white of egg, was introduced by means of a medium-sized glass nozzle attached through an india-rubber tube to a funnel which was held not more than 60 cm. high, and enough was allowed to flow till the splenic flexure was reached. The course of the enema was noticed. The colon was drawn, the iliac crests, umbilicus and nozzle were marked on the screen, and then all are copied on a tracing paper from the screen.

In this way, all the foundlings looked after in the Children's Section of the Qasr el Aini Hospital have been examined.

FIG. 3.—Case No. 1: showing the smooth adult type of large intestine in infants.

As this investigation was intended to demonstrate if there is any real relation between the occurrence of kinks in the course of the sigmoid colon and constipation in children, it was decided to classify the types seen into two main groups:—

1. The smooth type, which resembles very much the adult large intestine. The descending colon reaches the left iliac crest, sweeps across the left iliac fossa to the lesser pelvis, and joins the rectum without the slightest kinking (see Fig. 3).

We have found no reference to this type in the literature examined.

2. The kinked type, where the iliac and sigmoid colons, being too long and unable to lie in the lesser pelvis, are thrown up into the abdominal cavity and thus kinked.

Of these two main types there are few sub-types:—

The only sub-type of the first is what we have called the high smooth type, where the descending colon before reaching the iliac crest turns slightly towards the middle line and drops into the lesser pelvis without lying in the left iliac fossa (see Fig. 4).

Of the second main type, there are three sub-types:—

- (a) The ascendant, which corresponds exactly to the same described by Bourcart (see Fig. 5).
- (b) The transverse, which corresponds with the same transverse type of Bourcart (see Fig. 6).
- (c) The oblique, which is a combination of the above two sub-types (see Fig. 7).

We have not come across a case of the descendant type of Bourcart in which the sigmoid descends into the true pelvis and then ascends into the abdomen again before it descends to join the rectum. This can rarely, if ever, exist because of the comparatively small size of the lesser pelvis in infants.

Table 1 summarizes the above classification and gives the percentage of every type:—

TABLE 1.
FREQUENCY OF DIFFERENT TYPES OF LARGE INTESTINE IN INFANTS.

Types.	Below 1 year.		1-2 years.		2-3 years.		Total.	
	No.	per cent.	No.	per cent.	No.	per cent.	No.	per cent.
1. Smooth type:								
a. Ordinary	2	3.23	1	4.00	1	11.11	4	4.17
b. High	6	9.68	2	8.00	0	0.00	8	8.33
Total	8	12.91	3	12.00	1	11.11	12	12.50
2. Kinked type:								
a. Ascendant	32	51.61	9	36.00	2	22.22	43	44.79
b. Transverse	10	16.13	7	28.00	3	33.33	20	20.83
c. Oblique	12	19.35	6	24.00	3	33.33	21	21.85
Total	54	87.09	22	88.00	8	88.88	84	87.50

FIG. 4.—Showing the high smooth type.

FIG. 5.—Case No. 4: showing the ascendant type
Age: 2 years, 4½ months. Weight: 11·050 kgrm.
Stools: 4-5 daily.

FIG. 6.—Case No. 87: showing the transverse type
Age: 5 months and 22 days. Weight: 5.5 kgrm.
Stools: 3 times daily.

FIG. 7.—Case No. 90: showing oblique type. Age:
2 months and 3 days. Weight: 2 kgrm. Stools:
4-5 daily.

The possible relation between kinked large intestine and constipation.—The above 96 cases were examined once weekly from the time they were admitted to Qasr el Aini Hospital as foundlings until the time of the present investigation. The number of their stools is always recorded in their weekly reports, and on looking up these records, no case was constipated. Our standard for constipation is less than two stools in the 24 hours in the first year of life, and less than one stool in the 24 hours after this year.

The percentage of the kinked type of the large intestine in our series is 87·5 per cent., and that of constipation is nil. Thus we submit that there is no evidence showing any relationship between constipation and the shape of the sigmoid colon and the number of the bends in its course.

We have even come across cases with real twisting that show no constipation.

Constipation in Egyptian infants.—The percentage of constipation in the Egyptian infants seems to be low. From the records of the babies belonging to the Child Welfare Centre of Qasr el Aini Hospital, where the babies are inspected once weekly and where a record of their weight, general health, number and character of their stools are recorded, we found that out of 242 babies aged between 1 and 6 months, 13 (5·4 per cent.) were constipated, and amongst 141 babies aged between 6 and 12 months, 5 (3·5 per cent.) were constipated, and amongst 377 babies aged between 1 and 3 years, 3 (0·9 per cent.) were constipated. Therefore, in the above series of 760 babies below 3 years of age, 21 (2·7 per cent) were constipated. It is to be noted that all the babies belonging to our Child Welfare Centre are breast fed.

We thought it would be interesting to attempt to determine the shape of the large intestine of the above constipated cases. We were able to induce the mothers of eight of the above constipated children to let us carry out our investigations, and there follows the history of these cases and the X-ray reports of the large intestine.

Case 1.—A boy aged 10 months and 15 days, weight 8 kgrm. Stools once daily or every other day. X-ray report: transverse sub-type.

Case 2.—A girl aged 1 year and 15 days, weight 9·5 kgrm. Stools once every three or four days for the first three months. Bowels then got periods of normal defæcation, i.e., 3 daily, and others of mild constipation, i.e., once daily or every other day, but more on the constipated side. X-ray report: Hirschsprung's disease.

Case 3.—A boy aged 2 months and 23 days, weight 4·350 kgrm. Stools once every three or four days, once remained without defæcation for 7 days and on another occasion for 17 days. X-ray report: Hirschsprung's disease.

Case 4.—A boy aged 1 month and 2 days, weight 4·100 kgrm. Baby was normal for the first 15 days of its life defæcating twice daily. Then once daily for some time, then once every two days, at last it was constipated for 7 days. X-ray report: transverse sub-type.

Case 5.—A boy aged 8 months, weight 6 kgrm. Constipated since birth. Stools once every 15 to 20 days. X-ray report: Hirschsprung's disease.

Case 6.—A boy aged 1 year and 4 months, weight 7 kgrm. He was admitted complaining of no defæcation for 4 days. A purge had been given without avail, and an enema without result. There was no vomiting but there was severe distension. History of similar attacks when four months old lasting for 8 days and said to be relieved by medicine. X-ray report: ascendant sub-type with many kinks.

Case 7.—A boy aged 7 months and 10 days, weight 5·250 kgrm. Stools once every four days. X-ray report: ascendant sub-type.

Case 8.—A girl aged 6 months and 9 days, weight not recorded. Stools once daily. X-ray report: smooth type (Fig. 8).

FIG. 8.—Case No. 8: showing smooth type. Girl aged 6 months. Stools: one daily.

Three, therefore, of these eight cases of constipation were cases of true Hirschsprung's disease, an easy explanation of the constipation. Two of the other five cases are of the transverse sub-type, another two are of the ascendant sub-type and the last is of the smooth type. This Case 8 is very interesting indeed, as it shows that smooth large intestine can be constipated just as kinked large intestine can be on the diarrhoea side, and that there is no real connexion between the shape and kinks in the large intestine and constipation.

At the time we were carrying out these investigations, three cases were admitted to the sick children's ward for constipation, and the following is the history of these cases and their X-ray reports.

Case 9.—A boy aged 1 year and 3 months and 29 days, weight 9.300 kgrm. Stools once daily but very hard. X-ray report: Hirschsprung's disease.

Case 10.—A girl 1 year and 1 month, weight 7 kgrm. Stools once daily, on constipated side. X-ray report: ascendant sub-type with many kinks.

Case 11.—A boy aged 1 year and 25 days, weight 7 kgrm. Stools once every day or every other day. X-ray report: transverse sub-type.

Summary.

1. A better classification for the shape of the large intestine in infants into a smooth type and a kinked type with sub-types is proposed.
2. It is submitted that, contrary to the prevailing idea, there is no real relation between kinking of the large intestine and constipation.
3. Constipation is rare in Egyptian infants, and four out of eleven cases of constipation were examples of Hirschsprung's disease.