(Lillehei *et al.*, 1967). This is attributed to the vasodilator and positive inotropic action of such large doses of hydrocortisone. Similar therapy was successful in our patient.

Recent reports recommend that a rapidly acting thyroid hormone should be promptly administered to patients in myxoedema coma or pre-coma. The danger, particularly to the cardio-vascular system, must be balanced against the patient's need for urgent replacement of thyroid hormone.

There are conflicting recommendations for the choice of drug (L-thyroxine or tri-iodothyronine), the method of administration (intravenously or orally) and the dose (Rosenberg, 1968). Dyson & Wood (1956) suggest that 100 µg of tri-iodothyronine intravenously every 12 hr is adequate in coma and should not be exceeded. Ivy (1965) recommends that in pre-coma the initial dose should be 25 µg of tri-iodothyronine 12-hourly, which should be increased if the level of consciousness falls. Serious cardiac arrhythmia has been precipitated with as little as 10 µg intravenously given as a single dose albeit combined with metaraminol (Perlmutter & Cohn, 1964) and this writer recommends oral administration. Tri-iodothyronine is said to have a measurable effect after 6 hr and reach its maximum effect after 48–72 hr (Asper, Selenkow & Plamondon, 1953). There would seem, therefore, to be no advantage in giving the drug as a continuous infusion.

The patient has now returned to her Welfare Home. When seen 3 months after this illness she was alert,

mobile and able to hold a rational conversation. Her appetite was normal and the clinical signs of myxoedema had receded.

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Acute arteriomesenteric duodenal ileus as a complication following operative correction of scoliosis

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A MILD degree of paralytic ileus may follow operative procedures on the spine, but these episodes are usually transient. The insidious onset of a mechanical intestinal obstruction under these circumstances may present a diagnostic problem which can lead to serious consequences if unrecognized (Schaffer, 1962).

This report concerns the development of acute arteriomesenteric duodenal ileus as a post-operative complication following treatment of a severe scoliosis by the Harrington Rod Technique (Harrington, 1962). Previous reports of this condition have appeared under various titles including The Cast

Syndrome (Dorph, 1950) and the Superior Mesenteric Artery Syndrome (Kaiser, McKain & Schumacker, 1960).

Case report

T.M. aged 12 years. This girl with Marfan's Syndrome had a rapidly progressive idiopathic scoliosis. In her past history she had a ventricular septal defect closed successfully at 6 years of age, but there were no previous gastro-intestinal symptoms.

In 1963, when she was aged 8 years, the dorsal scoliosis was a prominent curvature convex to the right with an angulation subtended at the apex at

D7 of 39° on radiology. In 1965 the angle was 59° and in 1966, 79° . By January 1967 this had increased to 90° (Fig. 1) and at operation on 21 February 1967 a Harrington Rod was inserted from D1 to D12 with fusion of all the posterior joints. She was placed in a posterior body cast at the end of the operation and the anterior half of the cast was available for turning purposes.

She vomited 50 ml of bile-stained fluid on the 2nd post-operative day and after a further vomit on the 3rd day a nasogastric tube was passed. A volume of 1600 ml were aspirated on that day and on subsequent days aspirates of over a litre were recorded. Intravenous fluid replacement was maintained and all attempts to increase oral fluids were followed by vomiting. On the 10th day examination revealed a pale thin girl, not dehydrated, with an obvious prominence in the left hypochondrium. An occasional peristaltic wave was clearly visible moving from this towards the right. Bowel sounds were hyper-active. A straight abdominal radiological

film demonstrated a large fluid-level in the stomach and a single gas-filled loop representing the duodenum (Fig. 2).

Laparotomy on 3 March revealed a distended stomach and gross distension of the duodenum up to the point where the superior mesenteric vessels crossed the third part. The vessels were tightly stretched across the duodenum from the aorta which was abnormally situated to the left side of the lumbar vertebrae. The distal bowel was collapsed. Division or lysis of the ligament of Treitz and the peritoneal reflections of the duodeno-jejunal flexure was performed until the duodenum was freely mobile.

Following this procedure, bilious vomiting recurred on the 3rd post-operative day and despite all attempts to encourage drainage, including posturing, it was apparent that a mechanical obstruction remained. A gastrografin meal demonstrated a dilated duodenal loop with no passage of radio-opaque material beyond this on the 2-hr film (Fig. 3).

On 10 March a further laparotomy showed almost identical findings to the previous operation.

FIG. 1. A pre-operative X-ray of the spine showing dorsal scoliosis.

FIG. 2. A straight X-ray of the abdomen showing a single gas-filled loop representing the duodenum.

FIG. 3. Gastrografin meal showing the dilated duodenal loop with no radio-opaque material beyond this on the 2-hr film.

Because of the distorted anatomy a posterior gastrojejunostomy was chosen, in preference to a duodenojejunostomy. Subsequently, the child made an uneventful recovery and was transferred back to the Orthopaedic Ward on 25 March taking a full ward diet.

Discussion

Conventionally surgical correction of scoliosis has been by the use of a corrective plaster cast (Risser, 1955) followed by posterior spinal fusion (Hibbs, 1911; Moe, 1958). The chief disadvantages of the method have been prolonged immobilization, incomplete correction and frequent pseudarthroses. In 1962 Harrington introduced his system of instrumentation with rods and hooks. He claimed it could be used either in combination with spinal fusion or alone in children under the age of 10 years where such surgery would impair skeletal growth. According to James (1967) its clearest indication is in those cases associated with gross sensory loss of congenital or traumatic origin, where the use of casts is dangerous or even im-

possible. However, the method and the results await further evaluation.

Reports of abdominal complications following this technique are few. In his original paper Harrington reported a mild degree of ileus in most cases, not necessarily associated with the use of a plaster cast. Tambornino, Armbrust & Moe (1964) had one patient of 66 years so treated who developed a 'cast syndrome' on being put into plaster.

There are now a number of reports following correction of spinal deformity by application of plaster casts or by operative means where the obstruction is clearly a mechanical one. From the anatomical aspect the third part of the duodenum is held in the angle between the aorta and lumbar vertebrae posteriorly, and the superior mesenteric vessels and mesentery anteriorly. Strong (1958) discusses this aspect of the condition in his article, comparing the superior mesenteric artery to the surveyor's plumb-line and the weight of the small bowel and mesentery to the plumb-bob.

In 1950 Dorph reported a fatal case under the title of the 'Cast Syndrome' and reviewed four previous papers. Only his case and one other contained post-mortem evidence of this type of duodenal obstruction.

Kauffman & Gerbode (1951) described one case and Kaiser *et al.* (1960) described three cases, which followed application of body casts. The diagnosis was confirmed at laparotomy in all four patients when duodenojejunostomy was performed with complete recovery.

Schaffer (1962) reported eight cases of the Cast Syndrome. He commented that this complication arises only in individuals predisposed to such obstruction by anatomic variations in the abdominal viscera. He also mentioned the high mortality if the diagnosis is not recognized and treatment instituted.

In a review of the Superior Mesenteric Artery Syndrome, Hyde *et al.* (1963) described one child who developed this condition 6 days following spinal fusion and application of a body cast. Operative treatment was discussed in this article and lysis of the Ligament of Treitz was suggested as the procedure of choice. Both Strong (1958) and Major (Major, Ottenheimer & Whalen, 1960) also advocated this in their papers. Prior to these reports duodenojejunostomy, which was first employed by Staveley in 1907, had been the usual operative treatment for this problem.

Acute arteriomesenteric duodenal ileus is a rare cause of bilious vomiting which may follow correction of spinal deformities. It should be considered in the event of a prolonged post-operative ileus, and the diagnosis should be confirmed radiologically with the demonstration of gross dilatation of the

stomach and of the duodenum up to its third part where it is crossed by the superior mesenteric vessels. Treatment consists of immediate removal of the body cast if this has been applied and early operative treatment to alleviate the obstruction. The type of procedure undertaken has usually entailed a duodenojejunostomy but recent reports have recommended lysis of the ligament of Treitz. The latter procedure was initially performed in the case reported herewith but the obstruction was not satisfactorily relieved and a secondary by-pass procedure by gastrojejunostomy was necessitated.

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