three cases (Nos. 7, 12, and 13) excreted type-specific coliforms when no diarrhoea was present, and in Case 6 *Bact. coli* O26.B6 was isolated and identified immediately before any looseness of stools began.

Certain conditions seem to be necessary before type-specific coliforms can exert a pathogenic effect in the intestine. From the cases described, debility and general weakness are evidently important predisposing conditions, but there is evidence of another, unknown, factor. In Cases 1 and 15 there was no history of previous illness, and both patients were young and in relatively good health; nevertheless they developed severe diarrhoea, and type-specific coliforms were isolated in pure culture from each. This other factor may be related to the virulence of the strain concerned. That Cases 1 and 15 developed symptoms could be explained by the particular organisms being highly virulent. As both these patients had enteritis on admission to hospital, they were barrier-nursed, and thus it was not possible to assess the virulence of the organism by observation of a subsequent case-to-case spread. In general, however, the pathogenicity to adults of the type-specific coliforms seems to be of a low order. Thus Cases 7, 12, and 13, despite age and debility, were able to harbour certain of these organisms without developing diarrhoea: the transitory appearance of the organisms in these three patients suggests that there is no true carrier state.

Over the period of the investigation coliform diarrhoea had the same incidence as bacillary dysentery. This, plus the fact that several of the cases in the coliform series had blood and mucus in their stools, suggests that coliform diarrhoea in adult hospital patients may present itself in a manner similar to the shigella infections. There is, however, one main difference between the two types of diarrhoea: dysentery organisms tend to remain in the intestinal tract over a relatively long period, whereas infection with a type-specific coliform is usually transient. In most of the cases in the present series, particular coliforms could be identified only for about 48 hours, after which the stools became negative.

Only two patients in the series had any contact with young children (Cases 1 and 15), and in neither instance was there any definite link of infection so far as can be ascertained. Case 9 had a remotely possible contact with the infected child in a neighbouring ward, but here again the chain of infection is obscure. Contact with infants therefore does not seem to play an important part in the infection of adults with the type-specific coliforms.

Summary

During the examination of 894 faecal specimens from adult hospital patients, type-specific strains of *Bact. coli* were isolated from 15 cases. These strains belonged to O groups 111, 26, and 55; none of the E611, E990, or Canioni strains was found. Twelve of the positive cases had diarrhoea of varying severity; two of these patients died, the associated organisms being *Bact. coli* O26.B6 and O111.B4.

It is suggested that diarrhoea in adult hospital patients can be caused by type-specific strains of *Bact. coli* and that it constitutes a definite syndrome for which the term "coliform diarrhoea" may be used; the predisposing factors are discussed.

We wish to thank Dr. Joan Taylor for supplying cultures of the type-specific strains from which antisera were prepared, and also for confirming the 15 strains isolated during the investigation. Our thanks are also due to Dr. A. D. Briggs, medical superintendent, Stobhill General Hospital, for permission to make use of clinical notes.

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INFECTED URACHAL CYSTS

BY

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The first undisputed report of cyst formation in the urachal relic was contributed by Lawson Tait in 1883. It was, however, the researches of R. C. Begg (1927, 1930) which established the nature of development and anomalies of the urachus on a firm basis. The following facts emerged. The urachus and bladder develop exclusively from the ventral cloaca. The urachus arises by a narrowing of the cranial end of the cloaca and shares with the bladder in its post-natal descent from the umbilicus. In its descent the urachus drags down the adventitia of the obliterated umbilical arteries and, at the same time, its apex becomes broken up, leaving behind its epithelial cells. These epithelial cells may proliferate to form adenomata or, by central degeneration, give rise to cyst formation.

Although containing pus and debris, many cysts are sterile, others grow *Bact. coli*, streptococci, or staphylococci. The route of infection is probably haematogenous in most cases.

Incidence.—In reviews of the literature, Weiser (1906) collected 89 cases and Kantor (1939) a further 38. Since 1936 32 references to the condition have been found in the literature. Yoerg (1942) found only 3 cases in 12,500 admissions to the Brady Urological Institute. The recorded literature gives the impression that anomalies of the urachus are rare, but few experienced surgeons fail to claim one or two cases, and my own experience of four and possibly five cases in a short period strengthens the belief that they are not uncommon. Sex incidence is difficult to establish, but Kantor's analysis suggests an approximately equal incidence. Age incidence in his series varies from 20 months to 69 years.

Classification (Long, 1931).—(1) Those communicating with the bladder. (2) Those communicating with the umbilicus. (3) Those communicating with the bladder and umbilicus. (4) Those communicating with neither. Group 4 cases are most common, and it is easy to understand how these may become group 1 or group 2 as a result of infection.

Diagnosis and Treatment

It is probable that the majority of group 4 cases never come to light unless they become infected; they may give no symptoms and are discovered only at necropsy. The presence of a urachal cyst should always be suspected in any midline abdominal-wall swelling lying between the umbilicus and the symphysis pubis. Differentiation from vitelline cysts is facilitated when it is remembered that the latter are not continued downwards as a sinus towards the symphysis pubis (Yoerg, 1942). Cystoscopy helps in group 1 and group 3 cases, and a patch of bullous oedema in the apex of the bladder may lead to the suspicion of an infected cyst.

The ideal treatment is complete excision of the cyst and tract extraperitoneally. When infected, incision with drainage is often safer. In many cases this is curative, and in any event does not make complete excision at a later date much more difficult. Infection of the peritoneal cavity can generally be well controlled with chemotherapy, and, though undesirable, spillage does not lead to the serious peritonitis of former days. Opening the peritoneum need not be feared if that is necessary for the complete removal of the cyst and its tract.

Case 1

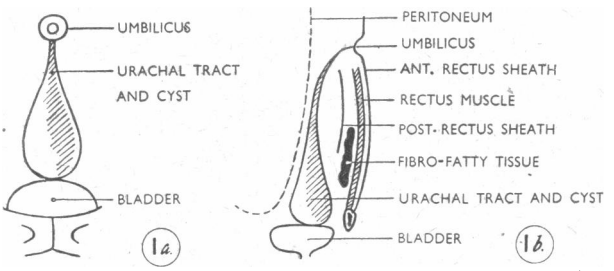
A roadman aged 46 was admitted to hospital complaining of difficulty in passing urine for three days, and of complete retention on the day of admission.

On examination his temperature was 99° F. (37.2° C.); his abdomen revealed an old puckered appendicectomy scar with surrounding fibrosis, and the scar of a right inguinal hernia repair. The bladder was distended halfway to the umbilicus. After unsuccessful catheterization he passed 14 oz. (400 ml.) of urine and continued to do so, although at first with some difficulty.

Investigations.—Urine: deposit of red blood cells, polymorphs, and Gram-negative bacilli. Blood urea, 40 mg. per 100 ml. Straight *x*-ray film and intravenous pyelogram normal. Cystoscopy showed general congestion of mucous membrane only. A diagnosis of acute cystitis was made, and after a course of penicillin the patient was discharged free from urinary symptoms.

Two months later he was readmitted because of subumbilical pain before, during, and after micturition. He was now tender below the umbilicus, and a plaque of induration was noted between the symphysis and the umbilicus but no swelling or inflammation. He had a mild fever and his urine contained mucoid material and a few red blood cells. Cystoscopy revealed a very prominent anterior commissure to the prostate and a small rosette of bullous oedema in the dome of the bladder. These findings were interpreted as being probably due to a urachal diverticulum. A cystogram showed an ill-defined extension from the fundus of the bladder.

Operation (See Figs. 1*a* and 1*b*).—Under penicillin cover a midline incision was made from the umbilicus to the symphysis pubis. This was deepened through the



FIGS. 1*a* and 1*b*.—Diagrammatic representation of operation findings in Case 1.

rectus sheath to expose a glistening mass of fibro-fatty tissue. The bladder was opened and a mass the size of a billiard ball was palpable in the dome, but no diverticulum could be made out. In an attempt to dissect out this mass it ruptured, with the escape of cheesy material and pus. Running up from the cavity thus exposed was a track lying extraperitoneally and extending almost to the umbilicus, the surrounding tissues being almost cartilaginous in consistency. As much as possible of the anterior wall of the track and cyst was excised. The interior was then curetted and finally treated with the diathermy button to destroy any epithelial elements. The bladder was closed about a de Pezzer catheter and the cyst and its track were packed with paraffin and flavine gauze. The wound was left widely open.

Pathology.—Sections of the walls of the cyst and track consisted of fibro-muscular tissue with inflammatory cell infiltration and exudate. Smears of pus showed fibrinous debris with epithelial cells and a few polymorphs. There were no organisms and no growth after 48 hours' incubation.

The wound slowly granulated to the surface; the de Pezzer tube was then removed and complete epithelization followed, leaving a very firm abdominal wall. Cystoscopy before discharge showed a completely normal bladder, and five months later he had no urinary symptoms and the abdominal scar was firm.

Case 2

A bricklayer aged 31 was admitted to hospital, having had soreness and swelling at the umbilicus for two weeks, followed by some vague abdominal pains. For the last four days the abdominal pain had become more severe. Meanwhile the swelling at the umbilicus had become larger, tender, and red. For three days he had not had his bowels open or passed flatus. He felt sick, but had not vomited. He had not previously noticed a swelling at the umbilicus, although it had never been a depressed scar. There had never been any discharge from the umbilicus or any urinary symptoms.

On examination his temperature was 100.6° F. (38.1° C.), pulse 80, and respirations 20. Protruding from the umbilicus was a red glistening swelling, about 2.5 cm. in diameter, which was very tender on palpation. At first sight this looked like a knuckle of bowel protruding through the umbilical cicatrix, but more careful examination showed it to be covered with skin, continuous around the margin of the umbilicus with the skin of the anterior abdominal wall. There were tenderness and guarding in both iliac fossae and in the umbilical region. Bowel sounds were accentuated. A provisional diagnosis of inflamed umbilical hernia with strangulated contents was made.

Operation.—The swelling was explored through a transverse elliptical incision and an infected urachal cyst was found. To its peritoneal surface the omentum was firmly adherent, and when this was separated the thin wall of the cyst ruptured, with discharge of pus and necrotic material. The whole cyst and the urachal cord were dissected out along with the umbilical arteries and their peritoneal coverings. The abdominal wall was repaired with stainless steel wire.

Apart from minor wound sepsis he made an uneventful recovery. The wound healed completely, leaving a firm abdominal wall.

Case 3

A carpenter aged 28 was admitted to hospital. Seven days previously he had noticed a stiffness in the region of the umbilicus after lifting some heavy weights. This persisted, and for four days there had been a yellowish discharge from the umbilicus. On the day of admission he developed a pain around the umbilicus, which became worse and at the time of examination was constant and severe. He had no alimentary or urinary symptoms.

On examination his temperature was 99.4° F. (37.4° C.), pulse 100, and respirations 20. In the umbilicus was a small red nodule from which yellow pus exuded on pressure around. There was generalized abdominal tenderness. The bowel sounds were normal and cystoscopy was negative. A provisional diagnosis of infected urachal cyst was made.

Operation.—Under penicillin cover, an elliptical incision was made around the umbilicus, and on deepening it through the rectus sheath a small urachal cyst was found in the extraperitoneal tissue below the umbilicus. A well-marked urachal cord continued down from this. The cyst, cord, and obliterated hypogastric vessels, as well as a portion of the ligamentum teres, with the peritoneum covering their posterior surface, were then excised. The wound was closed in layers, using stainless-steel wire for the rectus sheath. The subcutaneous tissues were drained with corrugated rubber. He made an uneventful recovery.

Pathology.—Microscopically no epithelial lining to the cyst was present and no lumen was visible in a transverse section of the distal end of the urachus. There were many pus cells and mixed organisms in the pus, but no growth on culture.

Case 4

A storeman aged 33 was admitted to hospital, having had a discharge from the navel for three weeks. His doctor had given him penicillin cream to apply. Three days before admission he began to have pain below the umbilicus which

was griping and spasmodic but not very severe. There was no nausea or vomiting, and no alimentary or urinary symptoms.

On examination a purulent discharge was seen coming from the umbilicus, and just below it there was a small spheroidal swelling in the abdominal wall. Cystoscopy and cystography were normal.

Operation.—A midline incision with an ellipse was made around the umbilicus. A urachal cyst was defined and dissected free. The urachal cyst was followed down to the dome of the bladder, where it was clamped and divided. The bladder wall was repaired in two layers with catgut. The obliterated hypogastric arteries were also dissected out, the whole procedure being performed extraperitoneally. The linea alba was repaired with wire and the skin closed about a corrugated drain.

Pathology.—Microscopically there was no epithelial lining to the cyst, and no lumen was present in a transverse section of the distal end of the urachus. The appearances were those of an infected urachal cyst.

Comment

Cases 1 and 2 fall into Long's group 4, and Cases 3 and 4 into group 2. They show several interesting points in the ways they presented, in diagnosis, and in treatment. Case 1 presented first as acute retention of urine, and there was difficulty in deciding how this arose. A possible explanation is that inflammation in the urachal relic caused a block in the lymphatic territory, which it presumably shares with the bladder-neck, since both derive from a common ancestor—namely, the ventral cloaca. This would cause oedema around the neck of the bladder, and a "congestive stricture" would result. Some support is given to this theory by the finding, on cystoscopy, of "a prominent anterior commissure" to the prostate which was probably due to oedema, since it had completely disappeared at the final examination. The ring of bullous oedema in the dome of the bladder which gave the first clue to the diagnosis was very striking indeed. Case 2 presented as an inflamed umbilical hernia with strangulation, and only at operation did the true nature of the condition become apparent. Cases 3 and 4 complained of a discharge from the umbilicus with an associated midline swelling, and a pre-operative diagnosis was made with confidence.

Case 1 was treated by saucerization of the cyst and track combined with diathermy cauterization of the epithelial lining. In Cases 2 and 3 the umbilicus and the urachal cyst and track were excised with their covering peritoneum; while in Case 4 the cyst and track were dissected out without opening the peritoneum. The final result was similar in each case.

In the last year one other case has been seen, which, although not capable of complete proof, is highly suggestive of urachal pathology.

A housewife aged 64 complained of a painful swelling in the lower abdomen of one week's duration. She had recently had an attack of influenza and bronchitis, but no symptoms referable to her genito-urinary or alimentary tracts. On examination there was a large rounded swelling in the anterior abdominal wall, extending up from the symphysis pubis, half-way to the navel. There was central fluctuation beneath red and oedematous skin, and obviously pus lay underneath. The mass was incised and a large quantity of foul-smelling pus escaped from a subcutaneous abscess. The latter led through a hole in the linea alba to another abscess cavity lying behind the recti muscles but in front of the peritoneum, which was intact. The abscess was saucerized and drained through two lateral stab drains with suture of the midline incision about a central drain. She made an uneventful recovery, and when seen eight months later the lower abdomen was quite healed and soft. Pathological examination of the pus showed numerous pus cells but no organisms. There was no growth on culture.

The midline situation of the abscess, its "collar-stud" nature, and the fact that the communication between its two compartments was so strictly midline suggested an infected urachal cyst as a possible diagnosis. Of course, the alternative diagnosis of an infected haematoma brought on by her recent coughing is equally admissible.

These cases seen in a short period seem to indicate that the urachal remnant is a more frequent cause of disease in the umbilicus and anterior abdominal wall than is perhaps generally realized.

Summary

The development of the urachus and the pathogenesis of urachal cysts are discussed.

A note is added on their incidence, diagnosis, and treatment.

Four cases of infected urachal cysts and possibly a fifth case are described and the clinical and operative findings commented upon.

I should like to express my gratitude to Mr. D. P. Marks, of Stratford-upon-Avon Hospital, and Mr. Henry Clarke, of Luton and Dunstable Hospital, for permission to publish these cases and for assistance with their management; to Mr. L. R. Broster for encouragement and criticism in writing this paper; to Dr. J. Bradley Watson for the pathological reports; and to the librarian of the B.M.A. Library for considerable help with references.

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LINGUAL THYROID

BY

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Lingual thyroid is a rare occurrence. It appears that Hickman recorded the first case in 1869. Buckman (1936) collected 242 cases from the literature up to and including 1935, but Montgomery (1935, 1936), studying probably the same material, reduced this number to 144 which he accepted as genuine lingual thyroids. Crispell and Parson (1950) stated that up to 1949 a total of 276 cases had been reported. Between 1949 and 1951 I was able to find seven more reports of lingual thyroid, including the case described below. In all these cases the lingual thyroid was causing symptoms; the incidence of silent cases will never be established.

Montgomery recognized as authentic lingual thyroids only those cases in which a specimen was examined and proved histologically to consist of thyroid gland tissue and when the lesion was situated in the tongue substance between the epiglottis and the circumvallate papillae. From the embryological point of view, it is natural to expect that the most common site for its occurrence in the tongue should be in the region of the foramen caecum.

According to Montgomery (1935, 1936), Goetsch (1948), and Nordland and Nordland (1950) "lingual thyroid" and "lingual goitre" should not be confused with "aberrant thyroids," as they accept the view of Warren and Feldman (1949) that the latter are metastatic deposits from carcinoma of the thyroid gland.

A great majority of reported lingual thyroids were histologically diagnosed to be benign. A definite malignancy in lingual thyroids was reported in few