TREATMENT OF SIMPLE EPITHELIAL CYSTS WITH SECONDARY PHOTO-ELECTRON RADIATION

PRELIMINARY REPORT

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This investigation was prompted by the relatively large number of children presenting at the Non-European Hospital, Johannesburg, for treatment of cystic swellings of the neck, generally of the "plunging ranula" type. For the purpose of this report a plunging ranula has been defined as any cystic swelling originating in the floor of the mouth and extending beyond the confines of the mouth.

Surgical removal has in our experience been unsatisfactory on account of technical difficulties encountered in the extensive dissection required and the frequent recurrence of the condition after removal. The injection of sclerosing agents has given uncertain results and produced occasional alarming reactions. Conventional roentgenotherapy with moderate dosage was found to be completely ineffective. For these reasons it was thought that an alternative form of therapy might be worth trying, and the gratifying results obtained with the safe and simple procedure adopted seem to justify publication at this stage.

Although the epithelial lining of these cysts is known to be resistant to ordinary doses of radiation, it was realized that it was possible to produce an intense local ionization in the cavity of the cyst with relatively small doses by exploiting the photo-electric activity of heavy metals exposed to Roentgen rays. It is a common experience in radiological practice that the presence in irradiated skin of heavy elements (ointments or lotions containing zinc, mercury, or iodine) causes a very great increase in the intensity of the skin reaction. It was therefore thought possible to destroy the secreting lining of a ranula by bringing into contact with it an aqueous suspension of a heavy element and exposing it to small doses of Roentgen rays.

The procedure provisionally adopted is to aspirate the contents of the ranula through a wide-bore needle under local analgesia and to introduce into the cavity 2 ml. of a 10% aqueous suspension of bismuth oxychloride ("bisoxyl"). This is followed by exposure to intermediate voltage Roentgen rays (140 to 180 kV) delivering about 300 r to the tissue at a single sitting. This quantity is entirely empirical; responses have been noted with smaller doses.

The photo-electric emission from irradiated matter varies in a complex manner with the atomic number of the elements concerned. It is estimated that, with use of the technique described, the composite value for the photo-electric absorption coefficient of the cyst fluid containing the suspended bismuth ($Z = 83$) would be not less than 40 times that of soft tissue (equivalent $Z = 7$); and the ionization in the immediate proximity of a bismuth particle might be many hundred times greater. The range of this secondary radiation, which consists entirely of relatively low-energy electrons, is only a few microns in tissue, so that

no more than a single layer of cells could be affected, and no damage could be produced in the tissues underlying this single layer of epithelium.

Reactions to the procedure have been fairly uniform. Initially there is a brisk effusion which persists for the first week after the operation, so that, despite the previous aspiration, the cyst becomes somewhat larger and more tense than it was originally. Thereafter the mass shrinks steadily and within three weeks has become a small fibrous nodule. These reactions produce no discomfort, and treatment in hospital is unnecessary after the first week.

The four cases reported below have been selected from our earliest trials in order to illustrate the effect of the bismuth injection alone and the superiority of the combined injection-irradiation procedure.

Case 1

A coloured girl aged 10 was admitted on January 26, 1949, complaining of a gradually enlarging swelling in the right side of the neck of several years' duration. On examination a soft fluctuant mass was found extending from the floor of the mouth to the clavicle, and from the midline into the right posterior triangle of the neck in front of the sterno-mastoid muscle. It did not move on swallowing and was not attached to the skin.

On February 1, 60 ml. of a watery straw-coloured liquid was aspirated and 2 ml. of bisoxyl introduced. Next day the cyst had become larger and was much tenser; 300 r was administered to the mass laterally, and a further 300 r through the anterior aspect. On February 15 (13 days after irradiation) the lower half of the cyst had become obliterated while the upper half had not changed. A further 2 ml. of bisoxyl was injected into the remaining portion of the cyst, and 300 r delivered through anterior and lateral fields. On March 1 (27 days after the first treatment) a small firmly indurated lump was present in the right submental region.

Case 2

A Bantu boy about 13 years old was admitted on February 16 complaining of a slowly enlarging swelling under the chin of three months' duration. On examination a round fluctuant mass about 8 cm. in diameter was found occupying both digastric triangles of the neck. It was continuous with a small swelling in the floor of the mouth to the left of the fraenum.

On February 24 the swelling was aspirated and 30 ml. of a yellowish gelatinous fluid was withdrawn. A further 10 ml. was aspirated on March 21 and 2 ml. of bisoxyl was introduced into the cyst. On March 24 the swelling had increased in size and was much tenser. The swelling in the floor of the mouth had also become larger. On April 23 (five weeks after aspiration) the characteristics had remained unchanged except that the cyst was a little firmer in consistency. X-ray therapy was administered, 300 r to the left and 300 r to the right side of the swelling. On May 5 (13 days after irradiation) the swelling in the floor of the mouth had disappeared, and that in the neck was hard and measured 3 by 2 cm. On May 17 (25 days after irradiation) the submental swelling was only 1 cm. in diameter, very firm, and loosely attached to the skin.

Case 3

A Bantu girl aged 15 was first seen in 1948, when she had a swelling in the right anterior triangle of the neck and another in the floor of the mouth to the right of the fraenum continuous with it. She was admitted in March, 1949, complaining of steady enlargement of the lump. On examination there was a soft fluctuant swelling, occupying most of the right anterior triangle, measuring 10 by 7 cm. and extending from the midline to disappear postero-laterally behind the sternomastoid muscle. At this stage there was no swelling in the floor of the mouth.

On March 16, 50 ml. of a thick yellow mucoid fluid was aspirated, and 2 ml. of bisoxyl introduced. Two days later the mass had increased in size and had become firmer. On

April 5 (20 days after aspiration) the characteristics had remained unchanged, and 104 ml. of a pale yellow slightly mucoid fluid was aspirated and another 2 ml. of bisoxyl introduced. Next day a tense swelling larger than the original was again present. On April 27 the characteristics were unchanged, and 300 r was directed to the lesion. On May 10 (13 days after irradiation) a small, firm, indurated right submental nodule was palpable but not visible.

Case 4

A Zulu boy aged 15 first presented in March, 1948, with a swelling of the right side of the neck. Examination revealed two unrelated disorders—an extensive unilateral tuberculous adenitis with suppuration, and a distinct fluctuant swelling in the right submaxillary region communicating with a similar swelling in the floor of the mouth. Deep x-ray therapy, generated at 180 kV (cp) with 0.5 mm. Cu and 1 mm. Al

FIG. 1A.—Case 4 before treatment.

FIG. 1B.—Case 4 six weeks after the injection-irradiation procedure.

filtration, was directed to the cervical lymph nodes, which received 600 r in two weeks. It is estimated that the ranula received a similar dose. The glands responded partially to this treatment; the ranula remained unchanged.

On May 31, 1948, a block dissection of the cervical lymph nodes was performed, and histological examination of the specimen confirmed its tuberculous origin. Post-operative recovery was uncomplicated. On June 19 the adenitis was apparently cured; the ranula, however, persisted, and 10 ml. of glairy fluid was aspirated and 2 ml. of a sclerosing agent ("ethamolin") injected, with little effect.

The patient was readmitted on February 22, 1949, complaining that the swelling had persisted and was again enlarging. From February 23 to March 25 five injections, each consisting of 2 ml. of ethamolin, and three aspirations were done. There followed a pyogenic infection in the cyst, which was then incised and drained.

He was readmitted on October 7 with a complete recurrence (Fig. 1A). Fluid was aspirated on October 20 and 2 ml. of bisoxyl injected and 300 r given. On December 6 (six weeks after irradiation), apart from a hard nodule less than 1 cm. in diameter, there was no perceptible abnormality (Fig. 1B). He was well when seen on January 4, 1950.

Conclusions

It is obvious from a study of these four cases that the bismuth suspension alone did not obliterate the cysts; further, it is our experience that irradiation alone has no perceptible effect; yet the combined action of the two agents is completely curative. It is proposed to excise some of the residual nodules for histological study, though this is cosmetically unnecessary. At the time of writing, one year after starting the procedure, there have been no failures and no recurrences.

We wish to acknowledge the stimulating advice freely offered by Dr. P. Keen, of the Non-European Hospital, Johannesburg, under whose supervision this work was carried out.

Medical Memoranda

Plasmodium Vivax Infection

The following case report is of interest because it draws attention to an unusual symptom-complex of *Plasmodium vivax* infection—namely, severe urticaria, abdominal colic, and fever.

CASE REPORT

A Punjabi Hindu medical student aged 33 was admitted to hospital at 9 a.m. on August 2, 1949, with severe abdominal colicky pain which had started at 7.30 a.m. He developed an itchy rash all over his body within a quarter of an hour of admission, while the distressing colicky pain was continuing.

On examination his temperature was 102° F. (38.9° C.), pulse 100, and respirations 22. His blood pressure was 95/55. His abdomen was uniformly soft and localized tenderness could not be detected. The spleen and liver were not palpable. The rash consisted of weals irregular in shape and size, varying from small papules to moderately large plaques, with a pale centre and slightly reddish margins, and itching intensely.

On further inquiry the following facts came to light. At 9 a.m. on July 27 he first experienced an acute abdominal colic, situated around the umbilicus; the pain persisted for about two hours, with intermittent exacerbations, and then gradually subsided without any treatment. His bowels had been opened by a dose of liver salts. He remained well until July 31, when at about 8.30 a.m. he suddenly developed an itchy urticarial rash all over his body followed immediately by abdominal colic of similar nature. His temperature was 102° F., pulse 104, and respirations 22. Calcium gluconate, adrenaline hydrochloride, and "antistin" were given and the rash and colic disappeared in one hour, while his temperature had gradually subsided by 8 p.m. The defervescence was not associated with sweating. At 9.30 a.m. on August 1 severe and widespread urticaria developed, but there was no colic. He did not feel feverish and the temperature was not recorded. Next morning he was admitted to hospital.

The following therapeutic measures were adopted immediately after admission: absolute rest in bed; 25% glucose, 25 ml., and 10% calcium gluconate, 10 ml., intravenously; adrenaline hydrochloride (1 in 1,000), 0.5 ml. subcutaneously; normal saline enema, 1 pint (570 ml.); and an ice-bag over the abdomen. Colic was not relieved, but further spread of the urticaria was checked. Half an hour later 2 ml. of antistin was given intramuscularly and then continued twice a day. The rash faded completely within the next 20–30 minutes, and the abdominal colic subsided gradually. Antistin, 0.1 g., pulv. calc. lact., 10 gr. (0.65 g.), and mist. alkal. diaphoret., 1 oz. (28 ml.), were given three times a day, and a sedative mixture with bromides and chloral was taken at bed-time. His diet consisted mainly of fluids—glucose water, barley water, green coconut water, milk, and tea. His temperature fell to normal by 7 p.m.

A blood count showed: Hb, 84% (Hellige); white cells, 7,000 (polymorphs 60%, lymphocytes 36%, monocytes 2%, eosinophils 2%). No malaria parasites were present in thick and thin smears. Examination of the stools (repeated three times) and urine revealed nothing abnormal.

Nothing untoward happened on August 3, but at 8 a.m. on the 4th the patient suddenly felt an attack of abdominal colic, which gradually grew worse and made him restless. His temperature was 103.4° F. (39.7° C.), pulse 102, and respirations 24. No urticarial rash could be detected anywhere on his body. He felt warm, but there was no chill or rigor. An ice-bag was placed over the abdomen and mist. carmin. bellad., 1 oz. (28 ml.), and antistin, 2 ml. intramuscularly, were given. The pain subsided gradually within half an hour. Thick and thin blood smears showed a fair number of B.T. malaria parasites, both ring and amoeboid forms (trophozoites). Proguanil was given immediately, two tablets three times on the first day, followed