GAS GANGRENE FOLLOWING THERAPEUTIC INJECTIONS

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GAS gangrene, developing as the result of subcutaneous or intramuscular medicinal injections, has been reported in the foreign literature in numerous papers, but, to date, there has appeared only one article in the American literature dealing with this condition. In 1936, Tenopyr and Shafiroff[59] reported three cases of gas gangrene following hypodermoclysis. Two of these patients died, and one recovered.

The first cases, of which the author was able to find any record, were reported by Brieger and Ehrlich,[9] in 1883. The first was that of a woman, age 26, who was extremely ill with typhoid fever. She had received a subcutaneous injection of moschus tincture into the right thigh. On the second day thereafter, typical symptoms of gas gangrene developed at the site of the injection, with swelling, pain, crepitation and discoloration. The patient died the following day without surgical intervention. The second case was that of a woman, age 32, also suffering from typhoid fever. She had received injections of ether and oil into the thigh. On the second day following the injections, the typical clinical findings of gas gangrene developed in the injected thigh, and on the fourth day the patient died without surgical intervention. The bacillus of malignant edema was found in both cases.

The second article dealing with this subject was that of Fraenkel,[16] in 1893, who reported two cases. One of these cases followed the injection of camphor, oil and ether, and the other of morphine. Other instances have been reported at irregular intervals since that time, until the later years of the World War, when the incidence of reported cases increased sharply. Seventy per cent of reported cases have appeared in the literature during the last ten years. In 1933, Junghahns[27] collected 60 cases. Twenty-five additional cases have been found in the literature, and one case of our own is added, making a total of 86 cases of gas gangrene following the injection of medicaments.

Case Report.—W. P., colored, male, age 63, was admitted to the Bryn Mawr Hospital April 3, 1936. A tentative diagnosis of partial intestinal obstruction was made at the time of admission, and during the next two days the patient received several intravenous injections of glucose in normal saline solution, into the veins of both arms. On April 5, an exploratory celiotomy was performed through a lower right rectus incision. A loop of the lower ileum was found to be strangulated in the right inguinal canal. The bowel was released, and after its viability had been determined, it was replaced in the abdomen. The internal abdominal ring was closed from within, and the abdominal wound sutured.

Postoperative Course.—Before and after operation, the patient received injections of morphia into the arm. During the afternoon and night of the third postoperative day, the

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patient received one injection of pitressin, and five injections of digalen. One of the injections of digalen was given into the right thigh. The other injections were given into the arms. Twenty-four hours after receiving the injection into the thigh, the patient complained of pain at the site of the injection. Upon examination, the thigh was swollen, tender and hot, these signs being most marked at the site of the injection. No crepitation was elicited at this time, and hot, wet dressings were applied. During the course of the next 12 hours, the patient's temperature rose from normal to 102.3° F. The local signs in the thigh became more marked, and crepitation was elicited.

Under local anesthesia, wide incisions were made into the infected thigh, and antiperfringens serum was administered, both into the tissues about the wound, and intravenously. The tissues were found to be distended with gas, and necrotic.

The patient expired six hours following this operation. Cultures of the infected tissues and of the skin of the unaffected thigh showed gram-positive rods which produced gas under anaerobic conditions. Culture of the digalen solution was sterile, but the syringe and needle were not cultured.

Seventy-six of the 86 cases reported, terminated in death, a mortality of 88.4 per cent. This figure is in marked contrast to the mortality of 49.7 per cent in 607 collected cases of gas gangrene following various injuries (Miller[40]).

The sites of injections were stated in 59 cases reported in the literature, and of these, 55 were in one or both thighs, the buttocks, or abdominal wall. Table I gives the sites of injection, and Table II shows the wide variety of drugs injected:

TABLE I

SITES OF INJECTIONS

One thigh	45
Both thighs (both injected and both infected)	3
Buttock and arm (both injected and both infected)	3
Thigh and arm (both injected and both infected)	2
Breast	2
Arm	2
Abdominal wall	1
Buttock	1

In nearly all cases reported, drugs, syringes, needles and solutions were cultured. A preparation of caffeine and digitoxin was found to contain gas organisms by Heuss.[25] Nauwerck[42] found gas bacilli in a preparation of caffeine sodium salycilate solution. Semenoff[57] and Anschutz[1] were able to culture gas bacilli from the needles used in their cases. These needles had been preserved in 96 per cent alcohol. Dimtza[12] found gas bacilli in one syringe, one needle, and in four files of the type used in breaking glass ampules. In all other instances in which studies were carried out, the drugs, solutions, syringes and needles were found to be sterile.

The patients to whom the injections were given suffered from a wide

TABLE II

MEDICAMENTS INJECTED

Caffeine	19
Adrenalin	11
Saline solution	9
Camphor	7
Quinine	5
Hackel's anti-asthmatic serum	5
Morphine	3
Digalen	3
Asthmalysin	2
Moschus tincture	2
Novocain	2
Ether and oil	2
Digatotal	1
Omnidine	1
Afenil	1
Calcium	1
Digipurate	1
Scopolamine	1

variety of diseases. Almost all of them were severely ill. The most frequent diseases were pneumonia, typhoid and malaria.

The time elapsing between the injection of the drug and the appearance of the clinical symptoms of gas gangrene was difficult to determine in most instances. This was true because the patients had usually received several injections over a period of several days. In 21 cases, we can say with certainty that clinical symptoms appeared between ten and 36 hours following the contaminated injections.

The time elapsing between the appearance of the clinical symptoms and the time of death could be accurately determined in 45 cases (Table III).

TABLE III

INTERVAL BETWEEN APPEARANCE OF CLINICAL SYMPTOMS AND DEATH

17 died during the first day
21 died during the second day
3 died during the third day
1 died during the fourth day
2 died during the sixth day
1 died during the seventh day

No attempt has been made in this paper to deal with the bacteriology, clinical course or treatment of gas gangrene. Attention is drawn to the facts that gas gangrene can and does occur after the hypodermic or intramuscular injection of medicinal agents; that the mortality is very high; *i.e.*, above 88 per cent, and that injections in the thigh are much more likely to be followed by gas gangrene than injections elsewhere in the body. The relatively high mortality in the cases in this series is possibly due to the fact

that almost all of the patients were severely ill before the contaminated injections were given. It is considered highly significant that 55 out of 59 contaminated injections were given into areas of the body surface which might easily be soiled by fecal material. For this reason, it is recommended that such areas—namely, the thighs, buttocks, and abdominal wall—be avoided when giving hypodermic or intramuscular injections. If these areas must be used, then the skin should be carefully sterilized, instead of receiving the perfunctory dab with an alcohol sponge, which is customary in most hospitals.

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