LOCAL COMPLICATIONS OF THIOPENTONE INJECTION

BY

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SUMMARY

Cases of local complications following injection of thiopentone that had been reported to the Medical Defence Union over a recent seven-year period were investigated. There were three cases of gangrene distal to the site of injection; five cases of isolated damage to nerves and muscles; ten cases of local tissue necrosis at the site of injection. It is estimated that the incidence of gangrene is probably less than one case in a million injections. Brief case reports are presented.

Local complications following injection of thiopentone are reported in the literature from time to time. It is impossible from a study of these reports, however, to be sure of the frequency of such complications. To estimate the probable incidence in this country of local complications following injection of thiopentone, the number of cases of gangrene, of isolated nerve and muscle damage and of local tissue necrosis associated with the injection of the drug that had been reported to the Medical Defence Union over the period 1957 to 1963 was determined and the cases were assessed. Brief case records are presented. The details will be as accurate as their drafting under a threat of litigation would allow.

CASE HISTORIES

Cases developing gangrene distal to the site of injection (three cases).

Case 1. A man aged 22 was anaesthetized for operation on a deviated nasal septum. Thiopentone (5 per cent solution) was injected into a vessel situated in the left antecubital fossa. The patient complained of pain at the site of injection. After operation he developed gangrene in the arm below the elbow, and amputation of the arm below the elbow had to be carried out.

Case 2. A woman aged 68 was anaesthetized for a biopsy of the vulva. Thiopentone (strength of solution not known) was injected into the median antecubital fossa. Seven and a half hours after operation the patient complained of pain in the arm. The radial pulse was good but the forearm was found to be tender and mottled and all the fingers were swollen. Brachial plexus block was carried out and anticoagulant therapy instituted. Necrosis of the thumb and index finger occurred.

Case 3. A woman aged 50 was anaesthetized for operation on haemorrhoids. She gave a previous history of having suffered pain, numbness and tingling in both hands on carrying heavy parcels and also during her second pregnancy. A small quantity of thiopentone (2½ per cent solution) was injected outside a vein on the dorsum of the right hand; the patient did not complain of pain in the hand or fingers. Thiopentone was then injected into a vein on the dorsum of the left hand and the operation completed without incident. Five days after operation oedema over the distal ends of all four fingers of the right hand was noted. Anticoagulant and antibiotic therapy was instituted but the fingers became gangrenous. Amputation of the fingers at the metacarpal phalangeal joints had to be carried out.

Cases of isolated damage to nerves and muscles (five cases).

Case 4. Thiopentone (5 per cent solution) was injected into a vein in the right antecubital fossa. Evidence of damage to the median nerve developed later with minor residual disability.

Case 5. A woman aged 36 was anaesthetized for manipulation of ankle. Thiopentone (500 mg of 2½ per cent solution) was injected into the antecubital fossa. Some of the solution was deposited outside the vein although there was no complaint of pain at the site of injection. There was damage to the median cutaneous nerve of forearm. (In an action for damages judgment was given for the patient.)

Case 6. Thiopentone (2½ per cent solution) was injected into the left antecubital fossa. Some of the solution was deposited outside the vein. There was temporary numbness of the arm.

Case 7. Thiopentone (5 per cent solution) was injected into a vein on the dorsum of the left foot. There was paraesthesia and partial anaesthesia of two toes.

Case 8. A man aged 23 was anaesthetized for appendicectomy. Thiopentone (5 per cent solution) was injected into the left antecubital fossa, but after 1 ml had been injected the patient complained of "burning sensation". Injection was stopped and 4 ml of 1 per cent procaine was given via the needle. Left brachial plexus block was carried out and appendicectomy satisfactorily concluded. Postoperatively the patient complained of glove-type paraesthesia of the left hand.
and lower arm. The patient was left with 1 inch of wasting of the left forearm and weakness of the muscles of the hand.

**Cases of tissue necrosis at site of injection (ten cases).**

**CASE 9.** Thiopentone (5 per cent solution) was injected into a vein in the right antecubital fossa. A large abscess developed at the site of injection.

**CASE 10.** Thiopentone (5 per cent solution) was injected into a vein in the right antecubital fossa. Cellulitis occurred at the site of injection with an associated loss of power in the arm.

**CASE 11.** Thiopentone (2½ per cent solution) was injected into the cephalic vein on the lateral aspect of the left antecubital fossa. Because the patient complained of pain, the needle was withdrawn and the injection continued into a vein on the dorsum of the left hand. Oedema developed at the elbow and the patient was left with an unsightly keloid scar.

**CASE 12.** Thiopentone (2½ per cent solution) was injected into a vein in the antecubital fossa. An abscess developed at the site of injection.

**CASE 13.** Thiopentone (5 per cent solution) was injected into a vein on the dorsum of the right hand. An ulcer developed at the site of injection and the patient complained of paraesthesia in the hand.

**CASE 14.** Thiopentone (strength of solution not known) was injected into a vein on the dorsum of the hand. There was some resultant disfigurement.

**CASE 15.** Thiopentone (strength of solution not known) was injected into a vein on the dorsum of the hand. A haematoma was produced at site of injection. Necrosis of tissue occurred which necessitated skin grafting.

**CASE 16.** Thiopentone (2½ per cent solution) was injected into a vein on the dorsum of the hand. Sloughing of skin occurred at the site of injection.

**CASE 17.** Thiopentone (2½ per cent solution) was injected into a vein on the dorsum of the hand. An abscess developed at the site of injection.

**CASE 18.** Thiopentone (5 per cent solution) was injected into a vein on the dorsum of the left foot. Ulceration occurred at the site of injection.

**DISCUSSION**

The eighteen cases detailed above of three different types of complication associated with the injection of thiopentone are the total number of such cases reported to the Medical Defence Union over a seven-year period.

The cases of isolated nerve and muscle damage and the cases of local tissue necrosis reported probably represent only a proportion of the total number of such cases encountered by members of the Union and therefore an accurate estimate of the actual incidence of such complications throughout the country is not possible.

With regard to the much more serious complication of gangrene, however, it is very probable that the cases reported do represent the total number of such cases encountered by members, and in this instance it is likely that a presumptive estimate of the incidence of the complication can be made with some accuracy.

Approximately half of the medical practitioners in Great Britain are members of the Medical Defence Union. As the number of thiopentone injections given per year in Great Britain is well in excess of one million, it is probable that members are responsible for at least half a million thiopentone injections per year. As only three associated cases of gangrene were reported over a seven-year period, it would seem that the incidence of gangrene associated with thiopentone injection is less than one case in a million injections.

This apparently low incidence of the complication over the period 1957 to 1963 is surprising considering that Cohen (1948) in a review of the subject wrote: "One anaesthetist has had the misfortune to be responsible for two such tragedies; and in one hospital, though the hazard was well recognized, there have been three tragedies...". However, it is significant that of the eleven cases of gangrene reported by Cohen in which the strength of the injected solution was known, 10 per cent thiopentone had been injected in nine and 5 per cent in only two. Undoubtedly the abandonment of the use of 10 per cent solution, as well as a greater awareness by the anaesthetist of the danger of intra-arterial injection, has led to a marked reduction in the incidence of gangrene although the 5 per cent solution is plainly not innocuous when injected intra-arterially. The universal adoption of 2½ per cent solution should lead to a further reduction in the incidence of this very serious complication; Kinmonth and Shepherd (1959) have demonstrated that intra-arterial injection of 2½ per cent thiopentone into the rabbit's ear produces only one-seventieth of the area of gangrene produced by 5 per cent solution.

The occurrence of gangrene after the injection of a drug is nearly always the result of inadvertent intra-arterial injection. This undoubtedly occurred in case 1 and in case 2. In case 3, however, gangrene occurred in a patient in whom 2½ per cent thiopentone had been injected into the dorsum of the hand. This patient gave a history suggestive
of cervical rib syndrome and it is probable that the complication was not associated with intra-arterial injection—notwithstanding the fact that injection into an artery can occur at this site (Baillie, 1958). The digital circulation was undoubtedly in a precarious state and gangrene could well have been precipitated by venous thrombosis leading to further impairment of the circulation in the limb. This case underlines the fact that when a limb has a poor or precarious arterial circulation, it is inadvisable to inject drugs indiscriminately into it.

Only five cases of isolated damage to nerves and muscles following injection of thiopentone appeared to have been reported to the Medical Defence Union over the seven-year period. It is clear that serious complications of this nature must also be comparatively rare.

Damage to nerves can be caused by infiltration of thiopentone directly round the nerve, or can be caused indirectly by intra-arterial injection of the drug. Wasting of muscles may follow damage to their nerve supply but muscle necrosis may result directly from intra-arterial injection. In the five cases described of isolated damage to nerves and muscles it is not possible to define the exact sequence of events that occurred in each case; in case 8, however, it would seem probable that the complications were secondary to intra-arterial injection of the drug.

Ten cases of tissue necrosis occurring at the site of injection were reported, but it is very probable that many other such cases go unreported. There is little doubt that this is (with the probable exception of venous thrombosis) the commonest local complication of thiopentone injection.

Necrosis of tissue at the site of injection may be caused by the direct toxic action of the thiopentone or may follow infection occurring at the site of injection. The fact that at least four of these cases were related to the injection of 2½ per cent thiopentone suggests that infection may play an important part.

Half of the ten cases of local tissue necrosis occurred after injection into the dorsum of the hand. Haematoma are likely to form in this situation and probably are, in such cases, an important aetiological factor (for example, case 15). The prevention of haematoma formation by the use of digital pressure over the site of injection must constitute an important safeguard against the development of the complication.

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REFERENCES


LES COMPLICATIONS LOCALES DES INJECTIONS DE THIOPENTONE

ON A ETUDIÉ LES CAS DE COMPLICATIONS LOCALES CONSECTIVES AUX INJECTIONS DE THIOPENTONE QUI ONT ÉTÉ SIGNALÉS À LA MEDICAL DEFENCE UNION SUR UNE PÉRIODE DE 7 ANS. IL Y A EU TROIS CAS DE GANGRÈNE EN AVAL DU LIEU D’INJECTION; 5 CAS DE LÉSIONS ISOLÉES DES NERFS ET DES MUSCLES; 10 CAS DE NÉCROSE TISSULAIRE LOCALE AU LIEU D’INJECTION. ON ESTIME QUE L’INCIDENCE DE LA GANGRÈNE EST PROBABLEMENT INFÉRIÈRE À 1 CAS SUR UN MILLION D’INJECTIONS. ON PRÉSENTE DES BRÈVES OBSERVATIONS.

LOKALE KOMPLIKATIONEN NACH THIOPENTON-INJEKTIONEN

ZUSAMMENFASSUNG

Es wurden die der Medical Defense Union während der letzten sieben Jahre mitgeteilten Fälle von lokalen Komplikationen nach Thiopenton-Injektion überprüft. In drei Fällen war es zur Gangrän distal vom Ort der Injektion gekommen, bei fünf Fällen lag ein isolierter Schaden an Nerven und Muskeln vor und bei zehn Patienten war eine örtliche Gewebekrebs am Injektionsort aufgetreten. Es wird geschätzt, daß auf eine Million Injektionen wahrscheinlich weniger als ein Gangränfall kommt. Es werden kurze Fallberichte gegeben.