

# TREATMENT OF THROMBOANGITIS OBLITERANS BY ROENTGEN THERAPY

## *Report of a Case*

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Good results have followed sympathectomy for thromboangitis obliterans in selected cases. Many reports concerning improvement after roentgen therapy appear in the literature. These reports were reviewed recently by Pfahler,<sup>1</sup> who discussed clinical signs and symptoms and various technics that have been employed for irradiation. He stated that his patients and others so treated had been benefited. Those patients in whom irradiation was directed along the spinal column to the sympathetics were improved, whereas those treated locally to the extremities were not.

There may be remissions of a few months or years during the course of the disease, although complete relief of symptoms and disappearance of signs for long periods probably would not take place spontaneously without treatment. The case being reported is of interest because the patient has been free of symptoms for thirteen years following treatment, and it may be justifiable to consider roentgen therapy responsible.

## Case Report

A man, aged 37, of Armenian-Jewish ancestry, was first examined by Dr. W. James Gardner at Cleveland Clinic in December, 1932. He complained of pain in his feet which had become progressively worse during the past five years. Three weeks prior to admission the medial surface of the left foot had become purple. He was no longer able to work because his job required that he stand all day. Walking even for ten minutes caused severe aching and numbness of both feet, which at times became swollen and dark red. Exposure to cold and dependent position aggravated the distress, while heat and elevation provided relief.

The patient knew of no one in his family having a similar condition. Except for his present trouble he had always been in good health and was the father of five healthy children. He had not used rye bread or coffee in excess, but he smoked at least twenty cigarettes a day.

There was nothing significant in the physical examination except that relevant to the legs and feet. Blood pressure, pulse pressure, and temperature were normal, as were laboratory and x-ray examinations. However, blood Wassermann test was 4+ on one occasion.

Both feet were swollen and discolored dark reddish purple over an area which extended just above the ankles, with the skin glistening and tense. This condition was more

apparent in the left foot. No pulsations could be elicited in the dorsalis pedis or posttibial arteries but were palpable in the popliteals and femorals.

Temperature recordings of the skin were made before and after spinal anesthesia. A thermocouple was placed on both big toes, middle phalanges of both hands, and chest. Temperature readings of these parts were taken and 2.0 cc. of spinocain was injected to produce anesthesia to the level of the nipples.

The following temperatures were recorded:

|                           | Before Anesthesia | After Anesthesia |
|---------------------------|-------------------|------------------|
| Mouth .....               | 99.0              | 98.2             |
| Right big toe .....       | 79.0              | 87.6             |
| Left big toe .....        | 83.0              | 83.1             |
| Right middle finger ..... | 89.0              | 89.9             |
| Left middle finger .....  | 89.0              | 91.9             |
| Chest .....               | 94.0              | 96.0             |

From this study it was concluded that there was good response in the right foot but none in the left. A diagnosis of thromboangitis obliterans was made and sympathectomy advised, but the patient refused operation. The referring physician, Dr. N. Churukian, gave antiluetic treatment.

The patient was seen four months after his original examination. The condition of the feet had progressed somewhat; the left great toe was cold, the skin black, scaly, and dry from impending gangrene. He again refused operation or to stop smoking. Roentgen therapy was recommended and given in March, 1933. Lumbar and lower abdominal portals 15 x 20 cm. were irradiated, each receiving 250 roentgens (skin dose) every fifth day for six treatments, 200 Kv. and filter equivalent to 0.8 mm. h.v.l.—copper being used.

Two months after this course of roentgen therapy there was no subjective or objective improvement, and a second course of therapy was given. At this time cervical, thoracic, and lumbar portals over the spinal column were irradiated, physical factors being as before. Each field received a total of 500 roentgens.

Two months after the second course of roentgen therapy there was definite subjective and objective improvement. The patient had little pain, the color of the feet was almost normal, and there was no swelling. However, no pulsations could be elicited in the arteries of the feet.

He was seen three years later (September, 1938), completely relieved of symptoms. The toes, which previously had been deeply discolored with incipient gangrene, were normal in appearance. The toe nails had come out spontaneously on two occasions in the meantime, and the new nails were ridged and deformed. Capillary circulation on pressure was good, and pulsations were elicited in the arteries. The temperature of feet and hands seemed to be the same on palpation. He had continued to smoke excessively and had refused to continue antiluetic treatment.

The results of roentgen therapy for this patient were recalled at a recent discussion of sympathectomy for thromboangitis obliterans, and he was asked to return for examination.

In June, 1946, thirteen years after roentgen therapy, the patient stated that he had had no further trouble, could work, and could walk several miles a day without discomfort. He had in no way changed his habits or undergone other treatment. The color of the feet was normal; the toe nails were deformed, but had not come out again; there was good capillary circulation in the toes, and pulsations were elicited in the dorsalis

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pedis arteries. The patient refused spinal anesthesia, therefore without it, temperature readings were made for comparison with those made in 1932. The following results were obtained:

|                           | 1932 | 1946 |
|---------------------------|------|------|
| Right big toe .....       | 79.0 | 91.0 |
| Left big toe .....        | 83.0 | 87.0 |
| Right middle finger ..... | 89.0 | 93.0 |
| Left middle finger .....  | 89.0 | 93.5 |

It was concluded that the marked increase of skin temperatures, especially of the left foot, indicated improved circulation which was attributed to roentgen therapy administered to the sympathetics thirteen years previously.

### Discussion

Apparently for many years most investigations of the etiology of thromboangitis obliterans were directed toward histologic studies of the blood vessels of the extremities. The pathologic changes have been described as including principally leukocytic infiltration and inflammation in all coats of the small arteries, with thrombosis and fibrous obliteration of the lumen.

It has been found that changes in the sympathetic ganglia are associated with alterations in blood vessels of the extremities. Craig and Kernohan<sup>2</sup> studied the histology of surgically removed ganglia and, among other changes associated with thromboangitis obliterans, observed proliferation of lining endothelial cells of arterioles and small arteries, thickening of the walls of larger vessels of the ganglia, no evidence of acute or chronic inflammation, and only mild edema of connective tissue. These changes were more marked in ganglia removed for thromboangitis obliterans than for other conditions.

Vasoconstrictor nonmedulated nerve fibers arise from groups of nerve cells of the lateral horns of the spinal cord from the first thoracic to the third lumbar segments. All arterioles of the body are supplied from these filaments. There is evidence that vasoconstrictor effects are the result of liberation of an adrenalin-like substance at or from the nerve endings in the arterioles. Cannon and his collaborators<sup>3</sup> called this substance "sympathin" and found that its formation is prevented by sympathectomy. Therefore, thromboangitis obliterans is thought to be due to a spasm of the blood vessels which results from hyperactivity of the vasoconstrictor nerves and production of sympathin. When the spasm-producing factor is present in blood vessels without advanced organic changes, sympathectomy or possible irradiation of the ganglia may be beneficial.

Although nerve tissue *per se* is resistant to irradiation, it is possible that irradiation may suppress the function of the cells which produce

sympathin. Alterations in function of some tissues (pituitary, thyroid) may follow irradiation without producing detectable histologic alterations.

It is interesting that the case being reported was not benefited by the first course of roentgen therapy directed only to the lumbar region below most of the ganglia (first thoracic to third lumbar segments) but was benefited by treatment directed along the entire spinal column, so that the entire sympathetic chain was irradiated.

### Conclusion

A patient having thromboangitis obliterans has been free of symptoms and signs of the disease for thirteen years, apparently as the result of roentgen irradiation directed to the spinal sympathetic ganglia.

Roentgen therapy may be indicated for thromboangitis obliterans when operation is refused or inadvisable.

The treatment should be given along the spinal column from the first thoracic to the third lumbar segments.

### References

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