

SOME ROENTGENOLOGIC CONSIDERATIONS PERTAINING TO UPPER EXTREMITY PAIN

CAPTAIN CHARLES F. BEHRENS (MC), U.S.N.
Chief of Radiologic Service, U. S. Naval Hospital
BETHESDA, MD.

It probably seems a bit odd and perhaps disappointing that a naval medical officer should deal with such a topic as upper extremity pain in times of war, when the fury of combat dominates the scene and the reek of gunpowder or trinitrotoluene fills the atmosphere. One would naturally expect or hope for a consideration of matters more specifically military.

In extenuation of my offense, I would like to point out that we can now afford less than ever to neglect the more prosaic and less glamorous fields of medical activity, for such neglect means the sapping of efficiency. The incidence of pain and disability involving the upper extremity is fairly high—just how high is difficult to say, since many cases are treated in an outpatient status and are not reflected in vital statistics with any approach to full measure. Many of these patients are seriously handicapped, are thoroughly miserable and at the same time have important duties. With all this in mind, I hope you will not take my efforts amiss.

Not so very long ago the etiologic differentiation of pains involving the extremities and the spine was in a rather rudimentary state. The tendency was to herd practically all of them together under the broad coverage of that ancient, patched and time worn umbrella—namely, rheumatism. The labor and studies of a generation or more of physicians has done much to clarify the situation and in latter years special advances have

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been made regarding the causes of low back pain and pain involving the lower extremities. I refer naturally to the discovery of the part played by disk injuries and hypertrophy of the ligamentum flavum; also misalignments especially at the lumbosacral articulation. These conditions have been thoroughly presented in numerous articles and textbooks. The matter of upper extremity pain, however, involves some conditions not so well clarified, and it appears well to take up a few of these from the standpoint of roentgenology.

Numerous indeed are the causes of the upper extremity pain, disability and abnormal sensation. A good many are of course obvious: contusions, sprains, fractures, dislocations, acute infections, rheumatic fever and the like. These seldom present diagnostic problems. Less obvious is the etiology in other cases, and naturally increased recourse is had to radiography for aid in the diagnosis. From this group a large number will be easily and promptly separated as cases of so-called "bursitis" or, as frequently designated nowadays, pararthrititis or peritendinitis, depending on the preference of the roentgenologist as to terminology. The main thing is that in these cases calcium deposits are often noted near the shoulder joint in the soft tissues, usually just above the greater tuberosity of the humerus and mostly located in or about the supraspinatus tendon. The matter has been well presented in a number of articles, including one by Pinner and Staderman¹ and earlier in one by Sandström.² There is no need for further detail here. I should like only to remind you that pain and disability are often most exceedingly severe and that furthermore roentgen therapy is usually most efficacious, often in sensational fashion. This condition, be it remembered, is quite frequently encountered in the service and at times in comparatively young persons. It should always be borne in mind.

In a disappointingly large number of cases, however, we will find roentgenograms of the shoulder negative. In such case one does well not to shrug the matter off as just another perplexing case of neuralgia, neuritis, fibrositis, rheumatism or what not but to proceed further and have studies of the cervical spine and upper thorax

1. Pinner, W. E., and Staderman, A. H.: Peritendinitis Calcarea, U. S. Nav. M. Bull. **39**: 521 (Oct.) 1941.

2. Sandström, C.: Peritendinitis Calcarea, Am. J. Roentgenol. **40**: 1 (July) 1938.

made. In occasional cases one will find such things as tumors of the vertebrae, tumors of the cord and its membrane, superior sulcus tumors, infectious processes, more or less extensive synosteoses, possibly to the extent of the Klippel-Feil variety, anomalies of various types, and so on, not forgetting a possible ruptured disk and, what is fairly common, cervical ribs. However, it might be noted here that most cases of cervical ribs are found incidentally and appear to occasion symptoms only on more or less rare occasions. Now the differential diagnostics of the various unusual conditions is a very interesting and fascinating subject, but on this occasion I should like to come down to humbler, more everyday, fare and ask your attention to the troublesome matter of symptoms referable to changes in the vertebrae and thinning of the intervertebral disks consequent on arthritic changes of degenerative hypertrophic type. These are well worthy of particular consideration, if for no other reason than that the relationship of the symptomatology in these cases to the underlying pathologic condition and also to possibilities of therapy do not appear generally to be realized or else tend to be forgotten.

As mentioned by Mettier and Capp³ in a study on neurologic symptoms in cervical arthritis, relationship between pain in the upper extremity and cervical arthritis was described some years ago by von Bechterew, Strümpell, Marie and others. These early writers noted, moreover, that there was little relation between the symptoms and the degree of arthritic involvement. It does not appear that much attention was paid to these observations then or, indeed, later. It seems that most of us tend to think of cervical arthritis as a remote and unlikely cause of upper extremity pain. On the contrary, it is a fairly frequent cause and the mechanism has been thought to involve the factors of narrowing of the intervertebral foramina due to productive osteoid changes and thinning of one or more disks, with irritation of or pressure on nerve roots. An explanation of the lack of correspondence between the degree of hypertrophic changes and the severity of symptoms becomes possible thereby: Arthritic changes of productive type

3. Mettier, S. R., and Capp, C. S.: Neurological Symptoms and Clinical Findings in Patients with Cervical Arthritis, *Ann. Int. Med.* 14: 1315 (Feb.) 1941.

need not and frequently do not affect the intervertebral foramens. If they are limited to the body margins they are relatively painless. In fact Oppenheimer and Turner⁴ in their study on discogenic disease and segmental neuritis have placed all emphasis on disk narrowing. I myself feel that either narrowing of the disk or productive changes significantly located may be factors. In addition I would suggest that there may well be factors of round cell infiltration, passive congestion and perhaps some degree of fibrosis; in other words, that there is often some degree of chronic inflammation, and I believe that this factor may often be more important than osteoid proliferation and thinning of the disks.

As for treatment, Mettier and Capp mentioned that some victims were relieved to some extent by the manipulations of irregular practitioners; also that in general the syndrome has been inadequately treated. The patients, bewildered and discouraged, only too often drift from one physician to another and from clinic to clinic, obtaining little if any relief. Treatment recommended by Mettier and Capp is along the conventional lines of massage, manual traction and manipulation. This, they say, has relieved the majority of the patients. At the present time I believe that the most frequently applied remedy, aside from strictly medical measures, is diathermy. My own experience with diathermy indicates that it has been of little value in these conditions; indeed, it often seems to aggravate symptoms. Careful manipulation, traction and massage produce much better results and, finally, excellent results are to be expected from roentgen therapy if earnestly followed.

Coming to my own experience, I am not able to furnish a large statistical series chiefly because, as usually happens in naval practice, we lose track of too many of our patients. However, I have seen perhaps a hundred or so of such cases, and these enable me to come to certain conclusions: (1) These cases are frequently encountered; (2) they are quite resistant to the usual medical methods of treatment; (3) diathermy is seldom helpful, but, as already mentioned, other physical therapy procedures are; (4) treatment by x-rays is one of the most effective methods we have,

4. Oppenheimer, A., and Turner, E. L.: Discogenetic Disease of the Cervical Spine with Segmental Neuritis, *Am. J. Roentgenol.* **37**: 484 (April) 1937.

This brings me to the matter of a more detailed consideration of roentgen therapy and naturally to the manner in which this type of radiation operates to relieve symptoms and effect any curative benefits. People in general appear mystified and skeptical that anything might be expected from this form of therapy.

It is often noted in cases of peritendinitis that calcium deposits, particularly of the amorphous and less compact types, are absorbed after or during a course of x-ray therapy. However, relief of symptoms in these cases is nearly always extremely prompt, often within a few hours after the first irradiation; it is far in advance of any considerable absorption of calcium. Moreover, relief of pain occurs even when calcium deposits fail of any absorption. Thus we see that improvement is not dependent on melting away of calcium and that other factors must be concerned. Further, it is obvious that the roentgen ray is not apt to rebuild a thinned disk. These other factors, as I hinted before, are probably related to inflammation. As is now well known and has been well reviewed by Drs. Pendergrass and Hodes,⁵ x-rays exert a potent beneficial effect on most inflammatory conditions. Although the exact details of the mechanisms involved are not too well understood, there appears to be more or less disintegration of white cells, particularly lymphocytes, with liberation of antibodies. However, changes in circulation likewise take place and, in fact, it is probably these changes which are of the most profound importance. Owing to the presence of an inflammatory reaction, we see infiltration by leukocytes, coagulation of lymph, appearance of fibroblasts and eventually formation of fibrous tissues in more chronic cases. All these tend to interfere with proper circulation and produce passive congestion. The effect of x-rays in appropriate dosage is to break up this type of reaction, which, although beneficial in walling off infected and damaged areas, none the less tends to be excessive, as only too often happens in natural processes. The end result of roentgen therapy is that an active circulation is substituted for passive congestion, thereby producing relief of pain and diminution in swelling along with encouragement of recovery. This relief of congestion is probably what accounts for the

5. Pendergrass, E. P., and Hodes, P. J.: Roentgen Irradiation in the Treatment of Inflammations, *Am. J. Roentgenol.* **45**: 74 (Jan.) 1941.

prompt relief of pain in so many cases, and of course it is the reactivated circulation which favors the absorption of calcium deposits. Naturally x-rays of themselves will not melt calcium.

Reverting to my cases of cervical arthritis and thinned disk, the main influence of x-rays doubtless is on the irritated and congested soft tissues about the affected segments. Reduction of swelling and improvement of circulation reduce the pressure on the nerve roots, and naturally symptoms improve. Any effect on the purely mechanical pressure from arthritic spurs or due to the thinned disks is not to be expected. It is notable too that the symptoms from these disorders of the cervical vertebrae are often slower to respond to x-rays than those from the so-called subdeltoid bursitis. Why this is so seems obscure, but the main thing is that they generally do respond in time and I usually caution these patients not to become discouraged if improvement is slow. Changes in the roentgenographic appearance of these cervical lesions have, in my experience, been negligible in contradistinction to the usual experience with shoulder calcification.

In connection with this form of therapy to the cervical spine it is interesting to note that hypertensive persons will commonly show a drop in blood pressure of substantial degree as the result of the effects of x-rays on the cervical sympathetic, chiefly the carotid ganglions. Unfortunately this improvement is not permanent.

As to plan of treatment and dosage employed, I have generally used moderate doses of 75 to 100 roentgens twice a week at first and later weekly. After six to eight treatments a rest period of about six weeks is given, followed by a second course. I have usually employed high voltage therapy (200 kilovolts, 0.5 mm. of copper and 3 mm. of aluminum filtration at 60 cm. distance). If this is not available a lower voltage with 3 mm. of aluminum or, better, 0.25 mm. of copper and 1 mm. of aluminum filtration will be usually found efficacious either in the cervical cases or in the cases in which the pathologic changes are limited to the shoulder proper.

As a word of caution it is necessary to point out that we are not going to help all cases and that accordingly if x-rays in adequate dosage fail to produce benefit

we should desist and revert to the more usual methods, such as heat, massage, traction, manipulation and support. Naturally the usual medical approach is not to be overlooked in any case. As far as the roentgen ray is concerned, we must avoid either extremes of giving up before an adequate amount has been given (even up to 2,000 roentgens in stubborn cases) or, on the other hand, of persisting unduly in the face of poor response.

Before closing there is one more cause of upper extremity pain I should like to mention, and that is herpes zoster. Not infrequently there is a brachial distribution. The pain and discomfort from this disease surely need no emphasis. However, it should be emphasized and reemphasized that out of all the various remedies x-rays will generally do the most. Further, one has to remember that in elderly patients pain is likely to be unusually severe and resistant and that radiation therapy needs to be pushed with some persistence. These problems, I might add, are well considered by Drs. Carty and Bond⁶ in a study on roentgen radiation as an analgesic agent.

SUMMARY

In many cases of pain and dysfunction involving the upper extremities, the roentgen ray will not only open the door to diagnosis but also frequently provide a most potent and welcome therapeutic agent.

6. Carty, J. R., and Bond, L. M.: Roentgen Radiation as an Analgesic Agent, *Am. J. Roentgenol.* **46**: 532 (Oct.) 1941.

