RADIATION SYNOVECTOMY WITH ^{32}P-CHROMIC PHOSPHATE

We would like to comment on the paper by Winston, et al (*1*) dealing with the intrasynovial instillation of ^{32}P-chromic phosphate.

In this paper we missed the reference to the report by Johnson and Christian (*2*) who were probably the first to administer colloidal ^{32}P-chromic phosphate in patients suffering from chronic effusions of the knee joints due to rheumatoid arthritis.

The value of the radiation dose 10,300 R/1 mCi of ^{32}P to the synovial surface having the area of 25 cm^2, as estimated by Winston, et al, seems to be excessively low. Calculating the dose, we assume that the distribution of ^{32}P-chromic phosphate on the synovial surface may be approximated by a plane source of radiation with the thickness of 20–40 μM and the area of 250 cm^2. The further assumptions being the same as in the paper by Winston, et al, our calculation yields the dose of 16,000–17,000 rads to the synovial surface per 1 mCi of ^{32}P. The calculation was performed according to the method described in our previous work (*3*). The average area of the surface of the synovial membrane, which should be taken into account when estimating the absorbed dose, is five to ten times as large as the value of 25 cm^2 considered by Winston, et al (*4–6*).

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THE AUTHOR'S REPLY

The points raised by Wiedermann, et al are certainly of interest and bear out the long experience of our European colleagues in this area.

We were aware of the report by Johnson and Christian and had in fact communicated with these authors. This was an abstract of results of using ^{32}P-chromate in a small series of patients. It did not consider the question of retention of tracer in the knee joint, which was the main thrust of our article; we therefore intended to cite it in a future paper that would deal with clinical results.

Our dosimetry was based on a presumed volume of distribution of isotope of 25 cm^3 (250 cm^2 surface $\times$ 1 mm thickness), and the 50% geometry factor of a semi-infinite beta source distribution (*1*). This was unfortunately garbled in the manuscript, the volume figure being substituted for the surface area, for which we apologize.

A somewhat more rigorous approach, utilizing the same dimensions and time parameters, considers an infinite plane slab source of finite thickness (*2*), and yields a dose of 6,542 rads at the surface, which we consider too low.

Wiedermann, et al apparently assume a much thinner slab ($<$ 40 μmeter) due to incorporation of isotope within the synovial cells, thus yielding a somewhat higher dose. This is certainly a reasonable supposition but assumes nearly instantaneous entry of colloid into the membrane. This, we feel, is likely to be a slower process, especially with colloidal particles of this size, so that many disintegrations are likely to occur in an area near but not necessarily within the membrane. Indeed, some particles remain suspended within the synovial fluid for considerable periods, as shown by the $T_{1/2}$ of synovial fluid activity.

Therefore, a 1-mm slab thickness was somewhat arbitrarily chosen. It may, in fact, be excessive so that the true dose will probably be found somewhere between the values cited.

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