Correspondence

Wear and osteolysis in total joint replacements

Sir—Supplement no. 278 "Wear and osteolysis in total joint replacements" by Kadoya, Kobayashi and Ohashi contains a summary of rabbit experiments on the effects of polyethene particles on a bone-cement interface. The first of the two summarized studies is published, but the findings were not statistically significant. The second study is unpublished. I would like to make 2 comments on these experiments:

1. The rabbit model is almost identical with the well-known rat model described by Howie et al. (1988). I think Howie's work should have been cited.

2. The statistical evaluation of the second study appears flawed. The authors ignore the fact that measurements from the 2 knees of 1 rabbit are dependent. The statistical test they performed was based on an assumption of independent observations: altogether 6 rabbits received PMMA plugs, and these were split into 3 groups, of which 1 received polyethylene particles. However, the authors incorrectly considered each of the 12 knee specimens to be an independent observation.

Together with the other cement types—in which no effect of polyethene was claimed—the experiment has 19 rabbits. These are unevenly distributed between 8 different treatment groups. The actual number of rabbits in each group is therefore minute.

3 groups received polyethene particles, and were statistically tested against other groups. Apparently (judging from study 1) the authors had expected an effect in at least 2 of the particle groups. Since only 1 group was finally claimed to show an effect, there is an increased risk that this may be a random occurrence.

Studies which can clearly show that particles induce osteolysis in experimental animals are still rare in the literature. I think many have tried to show this effect and, like myself and others, have failed (Aspenberg and Herbertsson 1996, Van der Vis et al. 1997). Therefore, if the conclusions had been based on valid statistics, the findings of Kadoya et al. would have been important. Considering the large effort they have already made, the relevant model and the interesting findings, I hope the authors regard this work as preliminary, and plan to extend it to produce reliable numbers.

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Sir—We thank Dr. Aspenberg for his comments. First, he is right in pointing out that our animal model was a modification of that described by Howie et al. (1988), and his findings should have been cited in our Supplement. His article was cited in the original article (Ohashi et al. 1994) and it was not our intention to claim any originality for our method. However, an important modification in our model was that particles were repeatedly challenged in the knee joint, which might be needed to produce the required inflammatory reaction and elevation of the joint fluid pressure, as recently reported (Aspenberg and van der Vis 1998).

It is well known, as he also pointed out, that reproduction of osteolysis in animals has been tried by many investigators, but has not been very successful. We are aware that the results obtained in our osteolysis animal model should be regarded as preliminary because of the small numbers of specimens, in which appropriate statistical analysis was difficult. In view of the above, we are now preparing a new series of experiments using improved particles (size, number and dose) in a reasonable number of animals.

Thus, we accept the correspondent's criticism and appreciate his helpful comments, but we do not feel that the methodology employed in our model is fundamentally flawed and believe that the results and conclusions have significant implications for future studies in this field.

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