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DIFFUSION OF TRANEXAMIC ACID TO THE JOINT

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Tranexamic acid (Cyklokapron, Kabi, Stockholm) in a dose of 10 mg per kg body weight was given i.v. to 17 patients at various intervals before operation on the knee joint, in order to elucidate the diffusion of the drug to the joint fluid and the synovial membrane. The acid diffused rapidly to both the above tissues, and in the joint fluid it reached the same concentration as in the serum. The biologic half-time in the joint fluid was about 3 hours. In the treatment of joint bleedings in hemophiliacs and in association with intra-articular operations on such patients tranexamic acid is a suitable supplement to conventional substitution therapy.

Key words: hemarthrosis; hemophilia; tranexamic acid

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Aminocaproic acid combined with replacement therapy has been used to minimize bleeding during orthopedic surgery on hemophiliacs, for example, in association with synovectomy (Storti et al. 1972). Ahlberg (1970) has shown that aminocaproic acid given intravenously (i.v.) diffuses to the joint fluid and synovial membrane. In the last few years aminocaproic acid has been superseded by a stronger antifibrinolysin, tranexamic acid, for the control of joint hemorrhages and loss of blood at operations on hemophiliacs. Tranexamic acid has also been shown to prevent degradation of the cartilage matrix in animal experiments (Telhag 1973) and may be useful in the treatment of degenerative joint diseases in man. However, the diffusion of tranexamic acid to the joint has not been investigated.

MATERIAL AND METHODS

The series consisted of 17 patients (10 men and 7 women) aged 25–72 (average 48.9 years). Ten patients were to be operated because of ruptured meniscus of the knee joint and seven were to undergo synovectomy of the knee joint because of rheumatoid arthritis. Tranexamic acid (Cyklokapron, Kabi, Stockholm) was given slowly i.v. in a dose of 10 mg per kg body weight 1–17 hours before the operation. At the operation all the synovial fluid was aspirated and a biopsy specimen of the synovial membrane was obtained. The specimens were frozen at — 20° C. Blood samples were collected immediately before the injection and at operation. Serum was obtained by centrifugation and stored at — 20° C until assayed. The tranexamic acid in serum, joint fluid and synovial membrane was determined according to Eriksson et al. (1974).

RESULTS

The concentrations of tranexamic acid in serum, joint fluid and synovial membrane at different intervals after intravenous injection are given in Table 1.

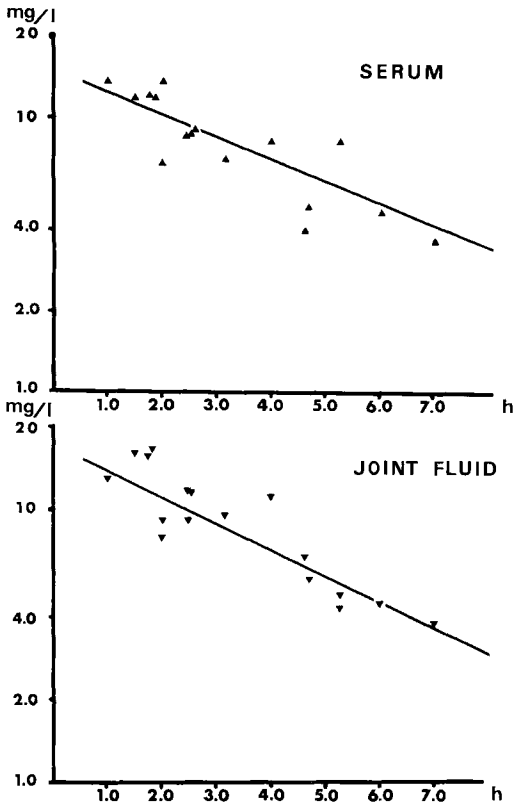

Figure 1. Elimination of tranexamic acid from serum and joint fluid.

The amount of synovial membrane obtained in 11 cases was not sufficient to permit exact quantitative determination of the concentration of the drug.

The biologic half-time of tranexamic acid was calculated to be about 3.5 hours in the serum and about 3 hours in the joint fluid (Figure 1).

DISCUSSION

The fibrinolytic activity in the synovial membrane has been shown to be abnormally high in hemophilic arthropathy (Pandolfi et al. 1972). It was therefore thought to be of clinical interest to investigate whether tranexamic acid given i.v. diffuses to the joint fluid and/or the synovial membrane. The investigation showed that the drug diffuses rapidly to the joint fluid, where it reaches the same concentration as that in the serum. No difference in this respect was found between patients with rupture of the meniscus and patients with rheumatoid arthritis. The drug was eliminated at roughly the same rate from the joint fluid as from the serum. The study did not allow any conclusions to be drawn about the concentration of tranexamic acid in the synovial membrane. However, the concentration tended to be initially lower than in the serum or joint fluid, but elimination took place somewhat more slowly. The findings suggest that tranexamic acid is a suitable supplement to substitution therapy in the treatment of joint bleedings in hemophiliacs and in association with intra-articular operations on such patients. When given i.v. the drug diffuses rapidly into the joint fluid and synovial membrane, which means that there is apparently no reason to inject it intra-articularly.

Table 1. Concentration of tranexamic acid in serum, joint fluid and joint membrane.

Patient (initials)	Hours after injection	Concentration of tranexamic acid (mg/l or kg)		
		Serum	Joint fluid	Joint membr.
E.T. *	1.00	13.8	13.0	11.4
B.M.M.	1.30	12.0	16.1	< 8.1
B.A.	1.45	12.4	15.7	< 8.5
K.O.	1.50	12.0	16.6	12.5
A.C.	2.00	13.8	9.1	< 5.5
H.L. *	2.00	7.0	7.8	8.3
M.T.	2.25	8.7	11.7	n.d.
S.B.	2.30	8.9	9.2	< 5.5
I.P.	2.35	9.5	11.4	n.d.
W.K.	3.10	7.2	9.5	< 3.5
A.H. *	4.00	8.4	11.3	7.1
F.W.	4.35	3.9	6.8	< 5.9
N.P.	4.40	4.8	5.6	< 4.8
A.B. *	5.15	8.3	4.5	4.4
I.P. *	6.00	4.6	4.5	n.d.
E.M. *	7.00	3.6	3.8	n.d.
S.K. *	16.50	< 0.5	< 0.5	2.5

* Patient with rheumatoid arthritis.

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