

## LACK OF EFFECT OF ULTRASOUND ON THE PERCUTANEOUS ABSORPTION OF BENZYDAMINE

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Phonophoresis is the movement of drugs through intact skin into soft tissue by ultrasonic perturbation (Skauen and Zentner, 1984). The technique involves placing the topical formulation on the skin over the area to be treated and massaging the area with an ultrasonic source. Despite its use for over thirty years little pharmacokinetic data are available. The aim of the present study was to determine if percutaneous absorption of benzydamine hydrochloride from a gel preparation could be enhanced by ultrasound. Benzydamine phonophoresis is used commonly in the treatment of sports injuries.

Drug absorption using a range of continuous ultrasound frequencies at an intensity of  $1.5 \text{ Wcm}^{-2}$  (see table) was examined in ten healthy volunteers on two study days two weeks apart. On each study day benzydamine gel (2.5g, 3% w/w; supplied by Riker Laboratories, UK) was placed on a 5 cm diameter circular site on the flexor surface of each forearm of the volunteers (each arm acted as an individual test). The gel was left for 5 mins (to saturate the stratum corneum) and was then massaged using an ultrasound head for a further 5 mins. The study was fully randomised and was carried out in a double-blind cross-over fashion. Following ultrasound the total remaining gel was carefully removed and weighed. A 5 cm diameter petri dish containing 10 ml isotonic phosphate buffer (pH 7.4) was then placed over the site and held in position using crepe bandage. This was left in place for 30 mins (to estimate back diffusion of absorbed drug and therefore give an indication of depth of drug penetration). Samples (buffer and gel) were analysed for benzydamine content using reversed phase HPLC with UV detection (305 nm; Benson et al., 1986). The benzydamine absorbed was expressed as a % of the amount applied and back-diffused drug calculated as a % of the amount of drug absorbed (see table).

	ULTRASOUND FREQUENCY (MHz)			
	0 (control)	0.75	1.5	3
Benzydamine absorbed %( $\pm$ SE)	24.33 $\pm$ 1.2	23.69 $\pm$ 1.25	24.97 $\pm$ 1.30	24.60 $\pm$ 0.80
Benzydamine back-diffused %( $\pm$ SE)	1.53 $\pm$ 0.59	1.87 $\pm$ 0.53	1.47 $\pm$ 0.56	1.43 $\pm$ 0.39

Statistical comparison of the results (analysis of variance) showed that there were no significant differences ( $P > 0.05$ ) in absorption or back diffusion, between control data and those using ultrasound at differing frequencies.

Ultrasound treatment therefore did not lead to enhanced percutaneous absorption of benzydamine from the gel base; the results agree with those from a previous study which showed that ultrasound did not significantly increase percutaneous absorption of lignocaine (McElnay et al., 1985). The finding is in contrast to our recent finding of a statistically significant, though small, enhancement of fluocinolone absorption using phonophoresis (McElnay et al., 1986).

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