ADRENALINE AND ANESTHESIA

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I recently read an article by David Seager on adrenaline and anesthesia (*Forum,* vol. 6, no. 6). It has been an excellent article, raising in me a lot of questions (and some doubts) like all the nice articles. I feel the comment on the quantity of adrenaline that can be safely given subcutaneously [0.2 mg is equivalent to 20 ml of solution 1:100,000 (0.01 mg/ml), or 40 ml 1:200,000 (0.005 mg/ml)] is not well explained in the text, and can lead to some confusion.

Dr. Seager's Response:

Your comment on the quantity of adrenaline that can safely be given subcutaneously is a good one. As I stated in the article, no one can really give an exact maximal safe dose regarding this matter. There are so many variables that affect the equation: a) how much adrenaline may get absorbed systematically; and b) how much adrenaline can each individual tolerate systematically. The 0.2 mg figure that has been quoted in the literature applies to an amount given in one subcutaneously in a small area within a short time, as for instance, in the treatment of asthma.

Anyone who has used adrenaline clinically in that sort of manner, i.e., treating asthma, knows just how rapidly it is metabolized. Frequently such a dose of adrenaline will stop the asthma, but three quarters of an hour later, the patient starts panting again, as the adrenaline has been metabolized.

Now, in hair transplantation, we give the adrenaline in a lower concentration over a wider area, over a longer time period. There are no statistics quoted by anyone, to the best of my knowledge, that indicate how much is safe, and I don't think anyone will ever be able to determine any one maximum safe amount. If we give a 1:25,000 concentration of adrenaline into the scalp, there will be much less absorbed, than if we give a 1:200,000 concentration of adrenaline, because as you know, the stronger the concentration of adrenaline, the more effectively it constricts the vasculature limiting systematic absorption. So the concentration of the adrenaline solution we are giving has to be taken into account, just as much as the total dose. Moreover, the rate at which it is given, if you give it all within a two-minute period, immediately after sedating the patient, the peak blood level will be much greater than if you infiltrate first the donor area and take ten minutes to do that, and then after a 45-minute delay, you spend another ten minutes infiltrating the recipient area.

We are into time deviations, whereby after the time, in this type of scenario, one begins to infiltrate the recipient area, all the adrenaline that

was given 45 minutes earlier into the donor area will likely be metabolized.

I am sure age makes a difference. With nearly all drugs/hormones, the older one is, the more slowly one metabolizes and therefore, the maximum safe dose has to be revised lower. Not only is the total amount absorbed impossible to determine because of all these variables, but of greater importance is the sensitivity of the electrical conducting system of the heart of the patient concerned, and the ability of the individual patient's cardiovascular system to withstand the stress of an adrenaline-induced tachycardia/or sensitivity towards developing an arrhythmia. For instance, there will be great difference between giving a dose "near the upper limit of normal" to a 200 lb. 24-year-old athlete who daily gets his heart rate up to 160 beats/minute for some time, versus a 60-year-old man with possibly occult coronary artery disease, who, unknown to everyone else, has ventricular ectopica, irritable myocardium, and, if he did any exercise, which he may not have done for many years anyway, would develop angina. This sort of patient, of course, could not stand nearly the dose of adrenaline, systematically absorbed, that the 200 lb. young athlete would handle easily and safely.

Because of all these, and probably numerous other variables, it is impossible ever to give a safe upper limit. That is why, in the article, I was careful to word it "my own routine."