

The safety of dental mini-magnets in patients with permanent cardiac pacemakers

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To evaluate the safety of prosthetic mini-magnets, 12 patients treated with implanted cardiac pacemakers were examined. Small cylindrical magnets were applied one, two, and three at a time to constant points on the pacemaker under electrocardiographic monitoring. No influence on the pacemaker was detected in nine of the patients, but limited changes were encountered in three patients. However, the changes disappeared when the magnets were moved 1 cm away. The conclusion was that the use of mini-magnets in dental care in patients with implanted pacemakers is safe and acceptable. (J PROSTHET DENT 1995;74:420-1.)

The use of rare earth magnets in dentistry to ensure the retention of overdenture or maxillofacial prosthesis has become increasingly popular.^{1,2} The magnets are usually made of cobalt-samarium or neodymium. Because of their small size and great capacity for retention, they are extremely useful for application in dentistry. Magnets are used more extensively in dentistry because they transmit little lateral force to abutments, are simple to insert and remove (self-seating), require no exact paralleling techniques,³ and have nondiminishing retentive properties compared with mechanical attachments.¹

The magnetic fields of these systems are either open or closed; the more recent systems use closed fields. The closed-field principle ensures that the surrounding tissue is protected from the effects of magnetic flux. Most patients who need prosthetics are in an older age group in which the use of permanent cardiac pacemakers is also most prevalent. Permanent implanted pacemakers are widely used throughout the world and are most frequently implanted in patients with symptomatic bradyarrhythmias, particularly when a likelihood of dangerous syncopal attacks is present. All modern pacemakers use a demand mode and start pacing whenever the sensed ventricular rate falls below a certain threshold.

Powerful magnets are used to check the function of demand pacemakers. Application of such a magnet over a demand pacemaker will change it to a fixed rate mode, which can induce ventricular fibrillation and death. This

study examined whether mini-magnets used in prosthetic dentistry are capable of changing the function of implanted cardiac pacemakers.

PATIENTS AND METHODS

A total of 12 patients in whom permanent cardiac pacemakers had been implanted were examined. The pacemakers (Medtronic-Spectrax units) were of the demand ventricular sensing and ventricular pacing mode. The ages of the patients ranged from 52 to 82 years of age (mean 71 years). Five men and seven women were studied. A 12-lead electrocardiographic tracing was obtained from each patient.

A large magnet was applied over the pacemaker, and the ability of the pacemaker to change from demand to fixed rate mode was examined. When the patient's own rhythm was operative, application of the magnet resulted in the appearance of paced beats, each preceded by a pacemaker artifact. When the heart was already paced before the magnet application, the application caused the appearance of three consecutive complexes at a rate of 100 per minute. Four identical points were marked on the skin immediately overlying the pacemaker, and the mini-magnets were applied on these points. The mini-magnets were applied one, two, and three at a time to each point under electrocardiographic monitoring. These small cylindrical magnets (base diameter 4 mm, height 2.5 mm, retention power 300 gm) were made of samarium-cobalt (Dyna Dental Engineering bv, Bergen op Zoom, Holland).

RESULTS

In nine of the 12 patients, no influence of the magnets on the pacemaker was detected. In the other three an influence identical to that obtained with the large magnet was detected when three open mini-magnets not attached to their keepers were placed together at a specific point on the skin overlying the pacemaker. In the same patients no influence was detected when either one or two magnets were

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placed at the same point, or when three dosed magnets were placed there. Also, when the three open magnets were moved 1 cm away in each direction from that specific point, the earlier influence disappeared.

DISCUSSION

This study evaluated the risk of the use of dental mini-magnets in patients who wore a permanent cardiac pacemaker. It was found that in 75% of the patients, no influence whatsoever of the magnets on the pacemaker could be detected, even when they were applied open and unattached to the keeper and were at maximal proximity. In the other 25% of the patients, limited influence could be detected, but only when the magnets were applied three at a time with open field and at a specific point. Removal of the magnet even 1 cm away from that point cancelled that influence.

CONCLUSION

It was concluded that with closed fields or with fields

more than 1 cm distance from the pacemaker, none of the magnets had any influence on pacemaker function. Thus the use of mini-magnets for dental care in patients with implanted pacemakers appears to be completely acceptable.

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