Dissolution of Salivary Calculi with Chemolysis and Ultrasound

Robert Schatton, MD¹, Hans-Georg Kempf, MD, PhD¹, Helmut Schatton, MSc²
¹Department of Otorhinolaryngology, Helios Hospital Wuppertal, University of Witten-Herdecke, Germany
²Hydrometallurgical Engineering, Luenen, Germany

ABSTRACT

Outcome Objectives
1. Investigate whether treatment with an ultrasound probe can reduce the weight of salivary calculi in vitro. 2. Determine the effect of ultrasound application on chemolysis of salivary gland stones with diluted acetic acid.

Methods
Ten submandibular calculi (mean weight 159±80.2mg) were halved. After randomization these halves were each placed in a beaker containing saline solution (0.9%, pH 5.3) or diluted acetic acid (0.6%, pH 2.78) respectively. An ultrasound probe (1mm diameter, 30 kHz) dived into the solution with a tip-to-calculus distance of 5mm. Ultrasound was applied in a continuous mode for three hours. To determine the extent of dissolution, the calculi were weighed and photographed before and after the treatment.

Results
The mean weight reduction of salivary calculi after ultrasound treatment was 2.2±1.1mg in isotonic saline solution and 19.1±13.7mg in diluted acetic acid respectively. The differences were statistically significant (p<0.005).

Conclusion
A weight reduction of salivary calculi can be achieved by ultrasound application in vitro. Ultrasound treatment enhances the effect of chemolysis with diluted acetic acid. This could be helpful to diminish the size of salivary calculi within the scope of minimally invasive treatment of sialolithiasis.

INTRODUCTION

Minimally invasive therapies of sialolithiasis like sialendoscopy and extracorporeal shock wave lithotripsy are limited by the size of salivary calculi. Chemical and electrolytic dissolution have been used successfully to reduce the diameter of sialoliths in vitro. The aim of this study was to compare the effect of ultrasound alone with the combination of ultrasound and chemolysis on salivary calculi.

METHODS AND MATERIALS

Ten submandibular calculi (mean weight 159±80.2mg) were halved. After randomization these halves were each placed in a beaker containing isotonic saline solution (0.9%, pH 5.3) or diluted acetic acid (0.6%, pH 2.78) respectively (97°F). An ultrasound probe (Labsonic M, Sartorius, Germany) with 1mm diameter dived into the solution (Fig. 1). The distance between probe tip and stone surface was 5mm. Ultrasound (30kHz) was applied in a continuous mode for three hours. To determine the extent of dissolution, the calculi were weighed and photographed before and after the treatment.

RESULTS

The mean weight reduction of salivary calculi after ultrasound treatment was 2.2±1.1mg in isotonic saline solution and 19.1±13.7mg in diluted acetic acid respectively. The differences were statistically significant (p<0.005). Photographs of the stone’s surface show the corrosive effect of the treatment (Fig. 3).

DISCUSSION

In previous studies it has been shown that chemolysis of submandibular calculi with diluted acetic acid can achieve a mean weight reduction of 3.6±2.1mg/h in vitro [1]. The mean effect of electrochemical dissolution was 5.4±2.9mg/h respectively [2]. In comparison with these two methods ultrasound application in combination with chemolysis seems to be more powerful (6.4±4.6mg/h).

CONCLUSIONS

A weight reduction of salivary calculi can be achieved by ultrasound application in vitro. The effect of ultrasound treatment can be enhanced by chemolysis with diluted acetic acid. This could be helpful to diminish the size of salivary calculi within the scope of minimally invasive treatment of sialolithiasis.

REFERENCES


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