The Comparison of Various Solution Effectivity on the Dilution of Cerumen Obturans in Vitro

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Abstract

Cerumen obturans is a pathological condition that is not life-threatening but can cause discomfort such as feeling full in the ear, pain, hearing loss and deafness as well decreased quality of life. This study aims to determine comparison of the effectiveness of six solvents, namely aquadest, NaCl salt solution 0.9%, coconut oil, olive oil, carboglycerin 10% and sodium docusate 0.5% of cerumen obturans in vitro and to know the duration the most effective contact time of a solvent against serumen solubility. This research is a laboratory experiment using 30 compacted obturated cerumen specimens weighing 40 mg each. Serumen solubility level is measured using Spectronic spectrophotometer 21. Comparison of the effectiveness of the solvent tested with using the One Way Anova test with alpha <0.05. The results show that the effectiveness of different solvents is significant at 20, 25 and 30 minutes only between Aquadest and NaCl 0.9% coconut oil and olive oil using a spectrophotometer. Tim effective contact in vitro is ≥ 20 minutes and inclined increase to the 30 minute limit. In the 20th and 25th minutes, NaCl 0.9% is the most effective solvent while at the most 30th minute effective is aquadest. Olive oil and coconut oil are solvents the lowest effectiveness. Water-based solvents are more effective than fat based solvent.

Keyword: Effectivity, Solvents, Cerumen Obturans, Vitro.

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A. INTRODUCTION

Serumen is a product of production sebaceous glands and cerumenosa glands in the outer third of the burrow ear. Under normal circumstances serumen can go out alone while chewing or swallow without us knowing. Cerumen causes problems when cerumen obturans occurs that is a pathological state of cerumen which although not life-threatening but can result in a sense of fullness in ears, pain, hearing loss and deafness and decreased quality of life (Guestet al., 2004).

There are various ways to issue serumen, among others, by using ear hooks, flushing method, administration serumenolitik or a combination between all three. In daily life, general public uses a variety ingredients for reducing ear complaints clogged due to the serumen with dripping water (H_2O), cooking oil(coconut oil), olive oil and others for the purpose of being able to soften hard and dense cerumen so that it can easily be removed from the ear. The ingredients use it still needs research to prove the benefits and usefulness scientific. In addition, 0.9% NaCl which is a physiological liquid is often used as a comparison control in doing test of cerumenolytic effectiveness in vitro and in vivo.

This study aims to compare the effectiveness of six solvents i.e. aquadest, NaCl 0.9%, coconut oil, olive oil, carboglycerin 10% and sodium dokusat 0.5% of cerumen obturans in vitro and to find out the most effective contact duration a solvent against serumen solubility.

B. METHODE

This research is an experiment in the laboratory using 30 obturans cerumen specimens derived from 11 cerumen obturans weighing ≥ 250 mg, blackish brown in color and consistency is hard and dense and can be divided 6 specimens weighing 40 each mg. Cerumen obturans are used instead. It is a keratosis obturans and is not contaminated with blood, cotton and substances other. Every six specimens used to compare the effectiveness of originating from the same serumen and dissolved each in 2 ml of aquadest, NaCl 0.9%, coconut oil, olive oil, carboglycerin 10% and sodium docusat 0.5%. Repeated 5 times using specimens derived from four other cerumen obturans. Solubility serumen was measured using Spectronic 21 spectrophotometer at wavelength 620 nm (Soewotto and Sadikin, 2001). Comparison of the effectiveness of the solvent tested with using the One Way Anova test with alpha <0.05.

C. RESULT AND DISCUSSION

There was a significant difference in the analysis of one way ANOVA on the effects of several solvents at 20 minutes (p = 0.03), 25 minutes and (p = 0.02) and 30 minutes (p = 0.011). Further tests with the Post Hoc Test showed that by using Spectronic 21 Spectrophotomotor significant differences in the effectiveness of the solvent against cerumen obturans were only observed between aquadest and NaCl 0.9% against coconut oil and olive oil. The results of the average solubility of the six solvents based on the contact time from minute 5 to minute 30 can be seen in Table 1.

From Table 1 it can be seen the average effectiveness of obtutance cerumen solubility in aquadest, NaCl 0.9%, coconut oil, olive oil, carboglycerin 10% and sodium docusat 0.5% which shows an increase in serumen solubility along with increasing contact time .

Table 1. Comparison of the Effectiveness of Some Solvents for the Solubility of Obturated Cerumen in Vitro

Solvent	Average of Serumen Solubility					
	5 minutes	10 minutes	15 minutes	20 minutes	25 minutes	30 minutes
Aquadest	0.0568	0.2214	0.3252	0.3930	0.4444	0.5246
NaCl 0,9%	0.0924	0.2346	0.3272	0.4378	0.4696	0.5156
Coconut oil	0.0170	0.0296	0.0326	0.0348	0.0364	0.0382
Olive oil	0.0108	0.0324	0.0414	0.0552	0.0750	0.0866
Carboglyserin	0.0722	0.1170	0.1364	0.1710	0.2062	0.2362
Sodiumdokusat	0.0166	0.0650	0.1378	0.1732	0.1948	0.2198

As shown in Figure 1, NaCl 0.9% and distilled water are the most effective serumen solvents. Coconut oil and olive oil are the least effective solvents. The effectiveness of carboglycerin is 10% and the sodium docate 0.5% lies between the two or in other words has moderate effectiveness.

Aquadest and NaCl 0.9% which are water-based solvents have a better solubility effect than carboglycerin 10% and sodium docate 0.5%, olive oil and coconut oil which are fat-based solvents.

In this study, it was found that the effective contact time for obturans solubility obtained in vitro was ≥ 20 minutes and tended to increase to the 30 minute limit. At minute 20 the highest solvent effectiveness was NaCl 0.9%, aquadest, sodium docusat, carboglycerin 10%, olive oil and coconut oil and at minute 25 cerumenolytic effectiveness of the highest was NaCl 0.9% respectively. , aquadest, carboglycerin 10%, sodium docusat 0.5%, olive oil and coconut oil. While at the 30th minute the best solubility effectiveness was aquadest, NaCl 0.9%, carboglycerin 10%, sodium dokusat 0.5%, olive oil and coconut oil

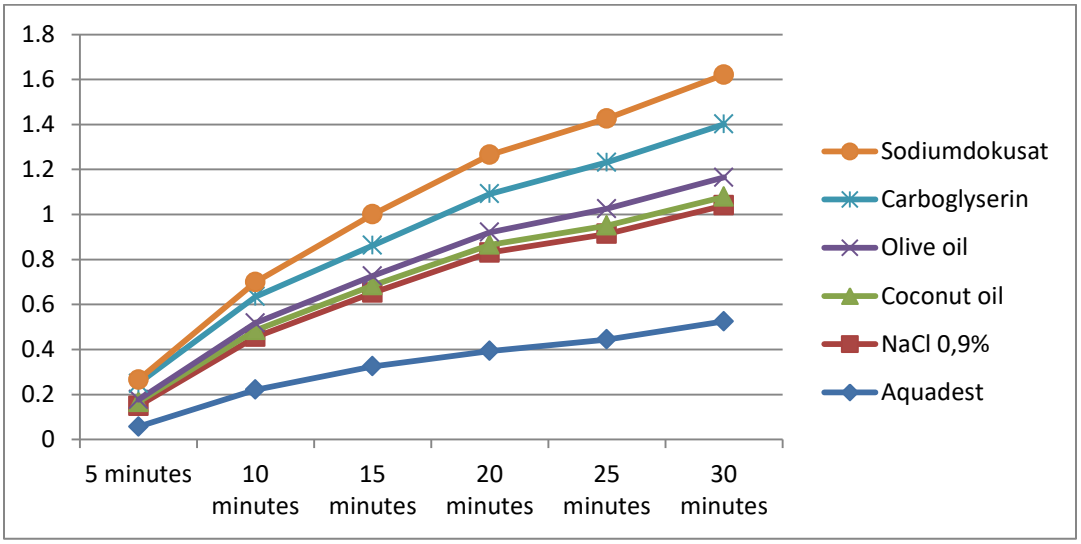

Figure 1. Comparison of the Effectiveness of Several Solvents for Obtum Solubility Obtained in Vitro

In this study, 30 specimens of cerumen originating from 11 cerumen obturans weighing, 250 mg, were blackish brown in color and were of hard and solid consistency and were divided into 6 specimens with a weight of 40 mg each. The serumen speech used in this study was modified in the form of compaction and reprinting using a 0.5 cm diameter cylindrical tube aimed at eliminating bias due to shape, size and consistency differences.

The results of the effectiveness of the solvents obtained in this study differed from the research of Rahayuet al., (2008) which showed the highest solubility of

cerumen obturans was hydrogen peroxide 3% (0.23867) followed by aquadest (0.08417), sodium dokusat (0.08017), olium kokos (0.01600) and carboglycerin 10% (0.01050). This is possible because in the study Rahayuet al., Used non-compacted serumen weighing only 10 mg and used several different solvents.

Aquadest / water is a universal solvent and does not change the pH of the solution because of its neutrality which in this study is the most effective solvent compared to the other five solvents in the 30th minute. Considering that the price is cheap and easy to obtain, aquadest can be a serumenolytic alternative. The results of this study also confirm the results reported earlier by Belliniet al., (1989) that aquadest is a more effective serumenolitik than the others. In addition, the research of Hawke (2007) shows that water as a cerumenolytic is as effective as 0.5% sodium concentrates.

The NaCl 0.9% which is an isotonic solution and is usually used as an infusion material, is often also used as a control in in vitro and in vivo studies. In this study, 0.9% NaCl showed the best effectiveness at the 20th and 25th minutes. This supports the results of previous studies that NaCl 0.9% is as good serumenolitik as cerumenex (triethanolamine polypeptide and oleic condensate 10%) and murine (10%) carbamide peroxide 6.5%) according to the study of Rolland and Smith (2008) in vivo.

In aquadest and NaCl 0.9% the water content it contains results in hydration of keratin cells which can further induce keratolysis resulting in disinintegration of cerumen bolus. Olive oil and coconut oil are the least effective solvents against cerumen obturans. This is presumably due to the function of oil which tends to be a softener and does not result in disintegration of the cerumen bolus. However, olive oil and coconut oil are fat solvents available in the household, are easy to obtain and are relatively safe so they can be used as an alternative to cerumenolitics.

The effect of serumenolytic carboglycerin 10% and sodium docusat 0.5% is between aquadest and NaCl 0.9% with olive oil and coconut oil. This is in accordance with the study of Belliniet al., (1989) who showed that the effectiveness of cerumenolytic sodium is central between water and olive oil. Carboglycerin 10% is a serumenolytic containing glycerin, used as a fat solvent while also containing water so that its effectiveness is better than 0.5% sodium docusat but lower than water and 0.9% NaCl.

The longer the contact time with a solvent the greater the solubility of obturum cerumen proved in this study. Based on the results that can be seen in Table 1 and Figure 1 above, it can be explained how long the effective contact time of a solvent for obturum cerumen is at least 20 minutes, and if the contact time is more than 20 minutes, it shows the higher level of solubility that occurs up to the time limit of 30 minute. Based on these results it can be recommended that the effective contact time for serumenolitic in ENT services is a minimum of 20 minutes.

The weakness in this study is that the effectiveness of some solvents is based on in vitro research, so in order to be able to apply directly to patients it is necessary to

conduct in vivo studies beforehand. This is important considering that the solubility of the cerumen in vivo is influenced by several factors including the anatomy of the ear canal, the surface area of the cerumen obturans in contact with the cerumenolytic, the dosage and its administration technique. Meanwhile in vitro applications have more limitations, although opportunities for modification are unlimited.

D. CONCLUSION

From this study it can be concluded that there is a significant difference in effectiveness between aquadest and NaCl 0.9% on coconut oil and olive oil but there is no significant difference in effectiveness among other solvents. The effectiveness of the solvent against cerumen obturans increases with increasing contact time. The statistically effective contact time with $p < 0.05$ is ≥ 20 minutes to the 30 minute time limit.

The effectiveness of the solvent based on the contact time in the 20th and 25th minutes is the most effective NaCl 0.9%. At the 20th minute showed 0,43780 absorbance, while for 25 minutes, 0.9% NaCl showed 0,46960 absorbance. As for the 30th minute the most effective is aquadest with 0.52460 absorbance. In vitro water-based solvents are more effective than fat-based solvents.

Because this research is in vitro in nature, it is necessary to further study the effectiveness of some of these solvents on the solubility of obturans cerumen in vitro. The study also recommends that the effective contact time of a cerumenolytic in an ENT service be at least 20 minutes.

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