

FINAL PROJECT

EAR WASH:

METAL OR DISPOSABLE SYRINGE

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Abstract

Introduction: The removal of cerumen is a technique that can be performed by otic wash with a series of instruments (syringe, gloves, etc.). It seems a simple technique, but it is not free of risks. In clinical practice, the otic irrigation is performed with metal otologic syringe or disposable syringe with adapted catheter.

Objectives: To determine which of the two types of syringe most commonly used for this procedure, the metal or the disposable syringe is more effective and produces less damage when performing an ear wash.

Methods: We perform a literature review of the available scientific literature through the most used data bases (Pubmed, Cochrane, CINAHL, Scopus...). Remarkably, due to the scarcity of documents that address this issue, studies, articles, protocols or clinical guidelines of various methodological designs were considered.

Results: The 29 bibliographies about ear wash expose various aspects of what is the proper syringe for ear washing, since some protocols recommend the otic irrigation with metal syringe and other studies consider effective and safe the use of the disposable syringe. We also found articles that oppose the use of otologic syringe because they associate it with higher risk of perforated eardrum. It is noteworthy that studies of higher methodological quality show no definite position concerning which syringe is right, or what material has higher cost effectiveness in clinical practice. In addition, the literature on the otic irrigation warns of the need of better training for professionals who develop the technique of ear wash.

Conclusion: Currently, scientific evidence shows a difference of opinion as to which syringe is suitable for ear washing, since the existing literature has neither the methodological quality nor appropriate level of evidence to make solid recommendations. In addition, the scarcity of clinical trials and observational studies require expanding the search to documents of a lower level of evidence, and therefore, clinical trials of a rigorous methodological quality are required to clarify once and for all the most relevant aspects about the otic wash.

Key words: washing, irrigation, earwax plug, otologic syringe, disposable syringe, pressures.

Introduction

Cerumen impaction (or earwax plug) in the External Auditory Canal (EAC) is a very common condition, diagnosed by direct visualization with an otoscope, usually with previous symptoms of transmission hearing loss.

The wax is conducted outwards thanks to the "conveyor chain" that the ciliary movement and the jaw joint form. However, this self-cleaning mechanism is sometimes ineffective, usually due to anatomical abnormalities or excessive production of keratin, which eventually cause cerumen impaction.

This condition causes a significant resource consumption of the public health system since the problems attributed to the accumulation of wax are one of the most common reasons for consulting a general practitioner; therefore the removal of cerumen is the most common ENT procedure at Primary Care.

Jointly, epidemiological studies agree that the earwax affects 2 to 6% of the general population, i.e. in Spain suffer between 1 and 2 million people, with the highest prevalence in older men and the people with intellectual impairments. In addition, it is estimated that more than half of this population attends Primary Care consultation to solve this problem^(1,2,3).

Regarding treatment for removal of earwax, already in ancient Egypt (over 3500 years ago), applied "compresses soaked in oil in the ears that hear little"⁽⁴⁾, referring to the hearing loss that causes the plug. Currently, the most common method is irrigation with warm water applied with a syringe, in combination with the application in earlier days of cerumenolytics washing^(5,6,7).

It is noteworthy that before washing is important to review the medical history, since wax impaction prevents proper review of the status of ear canal.

Also, ear washing is contraindicated if there has been previous surgery, in perforated eardrums, recurrent external otitis, or if the ear plugged is the only one hearing; in these cases they should be referred to specialist. Jointly, irrigation is not recommended for young children, not cooperating persons, hearing aid users, individuals with anticoagulant therapy, diabetics and immunocompromised patients^(8,25).

Furthermore, as for the staff performing the ear washing technique, over 80% of physicians delegate this manoeuvre to nurses⁽⁹⁾, therefore, these nurses must have legal training and be properly trained^(10,11).

To perform the technique, we first examine the ear canal, in order to define its anatomic position and check the characteristics of the earwax plug. Next, the user is placed sitting with a tray under the ear. Then the external ear must be stretched backwards and upwards in adults, and backwards and downwards in children for the EAC to remain straight. The syringe should be directed towards the upper wall of the ear canal, so that the jet of warm water (37°C approx.) drags the earwax outwards and does not impact directly against the eardrum. It is important to remember that we will observe with the otoscope the state of the ear canal after each irrigation. However, most guidelines recommend not making more than three irrigations, and therefore, if the removal of cerumen does not succeed the patient is cited for a new attempt on subsequent days.

To all of this, it should be noted that the ear irrigation predisposes to complications like pain, dizziness or vertigo, otitis externa, otitis media and tympanic perforation⁽¹²⁾.

As regards the main objective of this work it should be determined in the process of ear washing, what syringe contributes to greater effectiveness of washing and less risk of injury, the metal otologic syringe or the plastic 20 ml disposable syringe with needleless intravenous catheter?

In this regard, we must note that the reason for conducting this work is determined by the existence of numerous disagreements about the type of syringe to be used for this procedure, since during my clinical practice in health centres in Gran Canaria I have witnessed the completion of the procedure on some occasions with metal otologic syringe, and other with disposable syringe with catheter No. 16.

Similarly, when using different protocols and clinical guidelines of the national and international scene, we appreciate discordance between their recommendations. Therefore, one of the issues to consider is the excessive variety of criteria which manifests the literature about ear irrigation, causing the dispersion of the judgments.

In addition, through clinical practice we observed lack of clarity among nurses in both the necessary administrative procedures to be carried out before the technique, and the legal backing of the union nurse to perform this technique.

Consequently, we believe that there is a need to conduct a literature review to help us achieve the following objectives:

- To know the effectiveness of the metal otologic syringe for conducting ear washing and identify the damage that can produce this syringe.
- To know the risk of damage and the effectiveness of the disposable syringe with needleless intravenous catheter, for the execution of ear irrigation.
- To determine which of the two types of syringe is more effective and produces less damage when performing an ear wash.
- Identify the legal and professional training of nurses, and what are the necessary administrative steps to perform the technique of ear wash.

Material and method

Obtaining information is carried out through the library service of the Faculty of Health Sciences of Las Palmas de Gran Canaria. In addition, the clinical question has been structured according to PICO strategy (systematic work to organize searches).

Clinical Question: What syringe contributes to greater effectiveness of washing and less risk of injury, the metal otologic syringe or the disposable syringe with needleless intravenous catheter?

Type of question: Intervention

Components:

- Population/Problem/Situation: Population that requires the practice of ear wash.
- Intervention: Performing an otic wash with metal otologic syringe or disposable syringe with needleless intravenous catheter.
- Result: Safety and effectiveness of the intervention.

Bibliographic search: The search was conducted during the period between September and November 2014, using the following descriptors.

Table 1: Descriptors

DeCS	MeSH
Tapón de cerumen	Earwax
Jeringa desechable	Disposable syringe
Jeringa metálica	Metal syringe
Lavado de oídos	Ear wash

Search strategies:

Once the clinical question was determined, we proceeded to make a first literature search in the most common scientific databases. Besides, a reverse search was performed at the literature cited in the articles found, as well as a literature tracking through related articles. Also, we have selected documents through various search engines (Google Web, Google Books, Google Scholar) as a result of insufficient scientific evidence on the clinical question.

Table 2: Search strategies

Data Base	Search strategies
The Cochrane Library	“disposable OR metallic AND syringe AND wash AND ear”; “syringe AND wash AND ear”; “cerumen AND syringe AND ear”
Cinahl	“disposable AND syringe AND ear”; “ear AND wash AND cerumen”
Cuiden Plus	“jeringa Y lavado Y oídos” ; “jeringa Y desechable Y lavado Y oídos”
Google Web	“protocolo lavado de oídos”; “clínica guía tapón cerumen”; “revista facultativa”; “irrigación ótica”; “tratamiento tapón cera”.
Lilacs	“syringe AND ear AND wash”; “ear AND cerumen AND removal”

Pubmed	“ear AND cerumen”; “ear AND cerumen AND treatment”; “syringe AND impaction AND cerumen”; “metal AND syringe AND ear”
Scopus	“ear AND earwax”; “ear AND wash AND syringe”; “ear AND wax AND cerumen”; “ ear AND removal AND cerumen AND syringe”
Also in: BDIE, Clearinghouse, CUIDATGE, DARE, Google Académico, Google Books, IBECS, JBI ConNECT, Latindex, SciELO.	

Criteria for selecting studies

With regard to the selection criteria of the scientific literature, one of the initial objectives was to include in the work those studies that have greater methodological quality and high level of evidence, but due to lack of works with high scientific evidence that were related to clinical question, documents with a lower level of evidence have been considered.

Furthermore, no language restrictions were made, although all this literature is in Castilian or English. Furthermore, with regard to how current the studies are, it was considered the appropriateness of including those who were not older than 10 years, even selecting documents of 2014, although some studies or manuals over 10 years were included, as they contain important information and also provide a more global perspective helping to answer the clinical question posed, which we consider that enriches the work and increases their quality.

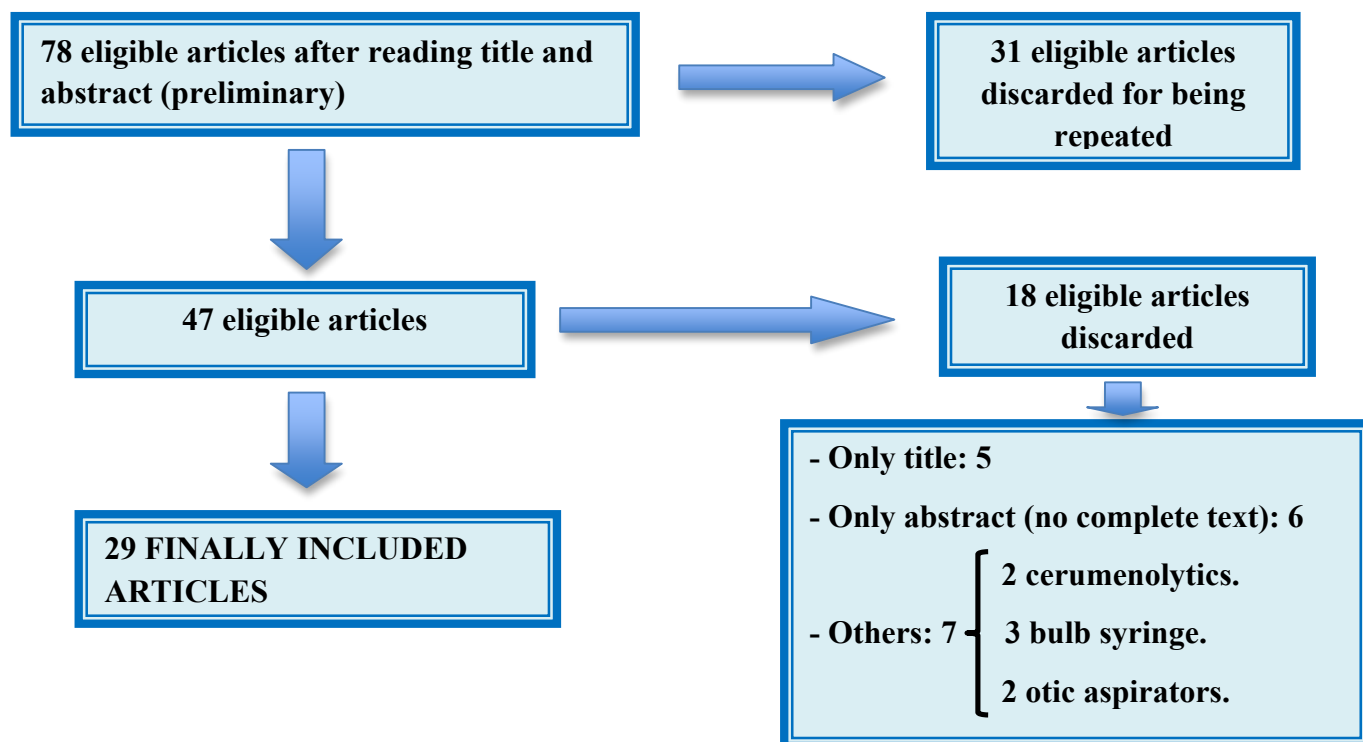
Furthermore, a significant number of studies reporting ear wash are excluded, as they only refer to the use of cerumenolytics.

Finally, some studies were discarded since we could not have access to the abstract or the full text. Moreover, these studies were requested from the library services of the University of Las Palmas de Gran Canaria, but there was no possibility of access to them due to budget cuts.

Results

The final selection of the literature is reflected below.

Flowchart:



Discussion

Validity analysis:

The studies were evaluated following the recommendation level of evidence from Sackett, Straus, Richardson, Rosenberg W and Haynes, 2002. (Table 3).

Table 3: Criteria, levels of evidence and grades of recommendation from Sackett, Straus, Richardson, Rosenberg W and Haynes, 2002.

Studies	Study type	Eviden. Level	Recom. Grade
Arjona Barcia FJ, et al 2014 ⁽⁷⁾	Nursing protocol	5	D
Fernández MJ. 2014 ⁽¹⁰⁾	Socio-labour article	5	D
Díaz Valero JD, et al 2013 ⁽²⁰⁾	Management Guide	5	D

Quirós Jiménez JR 2013 ⁽²⁴⁾	Continuing education manual	5	D
Fisterra.com. 2011 ⁽⁶⁾	Nursing protocol	5	D
Hernández Chafes FJ 2011 ⁽²⁸⁾	Research Article	5	D
Caballero M, et al 2010 ⁽¹⁾	Clinical practice guide	5	D
Clegg AJ, et al 2010 ⁽²⁾	Systematic review (RT, RCT, CCT, cohort studies)	1a	A
University of Maryland 2010 ⁽³⁾	Practical guide	5	D
S. Galego de Saúde 2010 ⁽²¹⁾	Clinical practice guide	5	D
Reddy HN, et al 2010 ⁽²⁶⁾	Scientific article	5	D
González Compta et al 2009 ⁽¹²⁾	Protocol	5	D
Sánchez Monfort J, et al 2009 ⁽¹⁶⁾	Management Guide	5	D
Gerencia A. S. Badajoz 2009 ⁽²²⁾	Nursing protocol	5	D
Roland PS, et al 2008 ⁽⁹⁾	Clinical practice guide	5	D
Universidad Industrial de Santander 2008 ⁽¹⁵⁾	Nursing protocol	5	D
Herraiz Mallebrera A 2008 ⁽²⁵⁾	Scientific nurse article	5	D
McCarter DF, et al 2007 ⁽⁵⁾	American Family Physician article	5	D
S. Madrileño de Salud 2007 ⁽¹³⁾	Protocol	5	D
SEMAP 2007 ⁽²⁹⁾	Positioning Report	5	D
Silva García L, et al 2006 ⁽²³⁾	Book/manual	5	D
Neno R 2006 ⁽²⁷⁾	Scientific nurse article	5	D
Kumar S, et al 2005 ⁽¹⁹⁾	Low quality clinical trial	2b	B

Guest JF, et al 2004 ⁽⁸⁾	Systematic review (RT, RCT, CCT)	1a	A
Aung T, et al 2002 ⁽¹¹⁾	British Medical Journal article	5	D
S. Canario de Salud 2002 ⁽¹⁷⁾	Action guide	5	D
Sevil Navarro J, et al 1998 ⁽⁴⁾	Research work	5	D
Sorensen VZ, et al 1995 ⁽¹⁸⁾	Clinical Trial (CT + T. in vitro)	2b	B
Múnera C LP ⁽¹⁴⁾	Management Guide	5	D

Qualitative synthesis

After the search, location and selection of studies and manuals that facilitate response to the clinical question posed or that had connection therewith, we will conduct a qualitative analysis of the selected bibliography:

For starters, in 2002 the "Action Guide in the Elderly in Primary Care" ⁽¹⁷⁾ printed by the Canary Islands Health Service, has been the only document in the islands we have been able to access. It transmits in his content the guidelines to follow before an earwax plug. This guide does not reflect either the steps or the materials to be used to perform this technique, since it only presents an algorithm of action lacking in its content of relevant information.

Moreover, in England and Wales it was held in 2004 a systematic review ⁽⁸⁾ to clarify questions involving the maneuver of ear wash. The results of the work, despite the effort made, does not clear any doubt about that, since it does not recommend any particular syringe for performing the technique. However, it does remark the fact that nurses often do not receive instruction in the use of the syringe. They conclude with many unknowns that are determined, according to the authors, by the lack of rigorous well-designed studies that facilitate optimal management strategies for the wax plug.

Without concrete results, as previous work, the prestigious clinical practice guide of "American Academy of Otolaryngology - Head and Neck Surgery"⁽⁹⁾ states that the otic irrigation can be done either with both the metal otologic syringe (Jenny), as with a disposable plastic syringe, not noticing differences between the two of them.

Along the same line, other authors⁽¹²⁾ affirm that there are different instruments for performing the technique such as classical metal otologic syringe, oral irrigators or 20 ml syringe with adapted plastic catheter, without distinguishing which of them it is safer and more effective or under what circumstances we can use one or the other.

Indeed, in the UK another systematic review⁽²⁾ published in 2010 analysed the evidence on the economic factor, through the relationship between the clinical effectiveness and cost effectiveness of the action of ear washing. Together, all wax removal methods were evaluated, although they failed to determine which syringe is most suitable to perform the technique. The authors concluded that there is no solid evidence, and therefore the results of their study should not be used for political-sanitary decisions.

Following this nonspecific aspect, the University of Maryland shows on its updated website in 2014 a practical guide for the removal of cerumen⁽³⁾. This guide is intended for the general public, and exposes the otic irrigation as a home manoeuvre, i.e. indicating to anyone how to perform an otic self-irrigation with syringe, and not specifying like the previous documents what type of syringe it should be used.

Also, the protocol of 2014 proposed by Fisterra.com, Primary Care Network⁽⁶⁾, details once again that it is not clear which is the best method for removal of earwax, and that the evidence in the literature are of low quality. Proof of this is that the protocol on the otic irrigation does not consider with which syringe the technique has to be performed. But it emphasizes the need to promote more training of health personnel.

In contrast, in the "British Medical Journal", a scientific paper for addressing cerumen impaction in 2002⁽¹¹⁾, considers the different modes of wax removal that are traditionally used, indicating that the otic irrigation with metal otologic syringe is the method most commonly used to solve the wax plug. However, warns that in case of using a Jenny syringe, the plunger should not be pressed too hard because, although is not harmful in healthy eardrums, it can damage the atrophic eardrum, so the professional performing ear irrigation should be suitably trained.

In the same direction, Silva et al⁽²³⁾, described in 2006 among the materials needed for ear washing in hospital nursing the sterile otologic syringe, not including the possibility of using a disposable plastic syringe in the technique.

Similarly, clinical practice guide "Temporary Hearing Loss"⁽¹⁾ in 2010 reaffirms the use of metal otologic syringe for extracting earwax. Notably, the authors acknowledge that, despite the frequency of this condition, there are no articles in the scientific literature to clarify the doubts raised routinely in clinical care.

In this sense, defending the postulate of the metal otologic syringe for carrying out the ear wash, several protocols^(7,13,15,20,22,21), expressing all of them exactly the same terms, confirm the use the metal otologic syringe Jenny as appropriate for otic wash. However, they remember that "slight pressure" on the plunger should be done to prevent eardrum injury because of the great pressure it produces.

However, Quirós Jiménez⁽²⁴⁾, despite establishing the use of the metal syringe Jenny in his continuing education manual in 2014, differs from previous documents on how to use the metal syringe in the otic irrigation, because in the description of the manoeuvre indicates "inject water with some energy," creating doubts.

Furthermore, and in contrast to literature that defends the use of the metal syringe Jenny, the guide created by Múnera⁽¹⁴⁾ includes as procedure the ear wash for removing of wax and foreign bodies. Among the necessary materials he points a 20cc or 50cc disposable syringe with adapted catheter.

Affirming this idea, an article published by the University of Virginia in 2007⁽⁵⁾, dedicated to cerumen impaction, warns that metal syringes may be poorly calibrated and cause trauma. It even recommends improvising an irrigation system using a disposable syringe of 20 or 30ml with catheter adapted, as it reduces the risk of tympanic damage.

Similarly, the Society of Nursing in Primary Care of Murcia⁽¹⁶⁾ states as required material to perform the procedure of otic wash the disposable 20 ml syringe with needleless intravenous catheter. The editors of this publication of 2009 use data obtained from the studies about pressures of Sorensen et al 1995⁽¹⁸⁾ and Kumar et al 2005⁽¹⁹⁾ to justify the use of the disposable syringe

Likewise, Reddy et al⁽²⁶⁾ in 2010 proposed as a new method easily accessible for professionals the disposable syringe, which ensures the sterility and safety of ear wash. Also noteworthy is the problem of the availability of the metal syringe in clinical practice, because it is reusable and must be sterilized.

Moreover, Sorensen et al⁽¹⁸⁾ conducted a research on maximum pressures obtained in the deepest part of the External Auditory Canal (EAC) in the otic irrigation, in order to dispel doubts about what syringe and under what circumstances it generates more pressure. Different variants were studied, one of which was how the anatomic disposition affected the increased pressure, resulting that the pressure increases as wider is the EAC, i.e., the wider the EAC, the greater the pressure generated inside, being highly significant the difference between the pressures obtained in narrow, wide and normal canals. But an even more significant factor was the comparison of pressures between the different materials used, like the metal syringe, disposable plastic syringe, glass syringe and bulb syringe, all of them of 100cc. The conclusions are clear since the metal syringe is the one creating more pressure (to 320 mmHg.), resulting that there are no risks in healthy eardrums, but there are in cases of tympanic atrophy. Moreover, at the conclusion it is advised not to press hard when it comes to the metal syringe Jenny.

Moreover, Kumar et al⁽¹⁹⁾ presented in 2005 the results of their clinical trial, in which it is determined that the use of a sterile kit consisting of a 20 ml plastic syringe with adapted intravenous catheter, is a method of ear washing safe and effective with easy operability and availability. The study included an in vitro experiment to calculate the pressure caused by the jet of water on the eardrum, resulting that the pressure generated by the 20 ml disposable kit was much less than the minimum pressure required to pierce an eardrum (50 mmHg.), even in atrophic state. Also, in the conclusions the researchers warn of the possibility of bacterial infection when using a metal syringe due to accumulation of waste water within.

In parallel, other authors^(25,27,28) warn that you should not use metal syringes for wax removal because they are classic and obsolete utensils of dubious safety. Also, they are difficult to manage and control and are associated with an increased risk of tympanic perforations, recommending the use of latest devices. They also indicate that the factors involved in the otic wash are undervalued, since there is a lack of research with consistent conclusions, as it was stated at the international conference on patient safety held in Madrid in 2006.

Table 4: Summary of positioning.

Position	Bibliographies	No.	Percentage
Otologic syringe	• 1, 7, 11, 13, 15, 20, 21, 22, 23, 24.	10	38%
No otologic syringe	• 25, 27, 28	3	12%
Disposable syringe	• 5, 14, 16, 19, 26.	5	19%
Undefined position	• 2, 3, 6, 8, 9, 12, 17, 18	8	31%

Finally, in relation to the legal and professional training of nurses, and the essential paperwork which establishes the legal framework for the ear washing technique, by the Royal Decree 1030/2006 of 15 September, it is stated within the portfolio of primary care services, "the removal of earplugs" (section 2.2.8 of Annex II of the aforementioned royal decree), indicating that the wax in the field of primary care may be removed by the general practitioner, paediatrician or nurse. In addition, the statement of the Superior Court of Madrid of February 5, 2008, reaffirms that nurses are qualified to perform this technique, although implementing a protocol that necessarily requires medical prescription and informed verbal consent⁽¹⁰⁾.

In this regard, the 2007 report on the Nurse Positioning SEMAP⁽²⁹⁾, demonstrates the competence of the nurse to carry ear wash, claiming the following arguments: "foundation of practice", since the most Colleges of Nursing Professionals attributed this technique to the nurse profession, "theoretical and practical training", since in the curricula of nursing this technique is contemplated, "literature foundation," noting the existence of clinical nursing literature indicating that otic wash should be an interdependent activity and sometimes independent of nurses, even including the "legal basis", since nurses with professional experience have acquired the knowledge, skills and attitudes of care health, which is a legal basis for action, which allows this technique.

Conclusion

After the qualitative analysis of the information gathered in the documents included in this literature review, numerous inconsistencies resulting from the conclusions of the studies

reviewed, referring to what syringe is appropriate for the removal of earwax by irrigation, noting an important diversity of opinions in the literature. In addition, all the texts expose the lack of research and the importance of establishing more rigorous designs and consistent study.

It is noteworthy that in the present investigations an incipient increase in the participation of nursing profession is detected, which we consider a key to solving the mysteries that surround the ear wash.

On the other hand, the deductions of research about pressures are obvious, as they reveal that the maximum pressure that produces the 20 ml syringe is up to four times lower than the pressure that causes the otologic syringe, being this pressure insufficient to break the tympanic membrane, but sufficient to remove the earwax.

However, the pressures of the metal device does not endanger a healthy eardrum, but an atrophic membrane; for this reason the literature that chooses the metal syringe warns that the plunger should not be pressed hard due to the high risk that assumes the enormous pressure generated, using subjective expressions like "inject water with slight pressure" or "inject water with some energy "; issue that calls into question the recommendation of the otologic syringe in a technique as compromised as this.

Finally, in the completion of a nursing technique it is important to prioritize the user's safety, and for this reason we consider the choice of sterile kit with disposable 20 ml syringe with needleless catheter, a new option that allows easy accessibility and operability for nursing staff in clinical practice as well as being safe and effective, as investigations on pressures demonstrate.

Also, it has been observed that the format of this kit and its technical features reduce the anxiety of the person in front of the ear wash manoeuvre due to its simple design and compactness.

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