

ORIGINAL RESEARCH ARTICLE

Use of image intensifier in the extraction of radiopaque foreign bodies in traumatology

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ABSTRACT

In the present research work, we investigated the use of the image intensifier in the extraction of radiopaque foreign bodies in traumatology. First of all, it is necessary to clarify that this method constitutes an essential component of practically generalized use, in which low current level radiation is used, that is, fluoroscopic radiation, so that it can be applied for a considerably longer time than that of the longest radiographic exposure. This tool works with a tube intended for this purpose, which is known as fluoroscopy. The radiations from the tube pass through the patient and reach the serigraph, on which the image intensifier or fluoroscopic screen is mounted. In the latter case, this is where the chain ends, since it is on this screen that the image is formed and where the physician directly observes the region to be studied. It is also necessary to define that a foreign body is any element foreign to the body that enters it, either through the skin or through any natural orifice such as the eyes, nose, throat, preventing its normal functioning. It was possible to obtain as a result that the advantages of fluoroscopic navigation are the reduction of surgical time and the amount of irradiation, which goes from about 140 seconds without navigation to only 8 seconds, which is a substantial difference. Among the conclusions, it was possible to highlight that in the case of a radiopaque object, it is essential to have an image intensifier for localization of the foreign body during surgery; while in the case of a radiolucent foreign body, it is more advisable to locate it through the clinic, since these tend to form granulomas.

Keywords: Image Intensifier; Foreign Body; X-ray; Surgery and Fluoroscopy

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1. Introduction

The electronic image intensifier systems used in radiology are an indispensable component that is almost universally used. In this case, low-current, i.e. fluoroscopic radiation is used so that it can be applied for considerably longer than the duration of the longest radiographic exposure.

The tube intended for this purpose is known as the fluoroscopic tube, which is located under the table in conventional systems. The radiations coming from the tube pass through the patient and reach the serigraph, where the image intensifier or the fluoroscopic screen is mounted. In the latter case, this is where the chain ends, since it is on the screen that the image is formed and where the physician directly observes the region to be studied^[1].

This led to the development of image intensification systems, which, based on the original idea of the fluoroscopic screen, improved the image obtained. Thanks to this system, the need for the observer to adapt to darkness is eliminated and, in short, more reliable scans can be performed with better radiation performance^[2].

Booster screens capture Rx photons and convert them into visible light photons, transmitting this light to the film, taking advantage of one of the properties of Rx, which is to produce fluorescence in certain substances. Fluorescence is the ability of certain compounds called phosphors to instantly emit light when Rx are hit by them. In this way, it is possible to irradiate the patient less by reducing the exposure time, in short, it is possible to reduce the exposure values, optimizing the dose received by the patient^[3].

Fluoroscopy makes it possible to locate the lesion or area of the body where a medical procedure, such as an injection or surgery, is to be performed. By specifically observing the body site, it is more accurate and the results of medical methods are more effective.

Likewise, a foreign body is any element foreign to the body that enters it, either through the skin or through any natural orifice such as the eyes, nose, throat, preventing its normal functioning^[4].

One of the possibilities of articular injuries is the penetration of a foreign body into the joint, which is not easy to detect without a thorough exploration of the wound and a radiographic study. The consequences of an articular foreign body go beyond a mechanical lesion of the articular surfaces, and it can cause serious arthritis due to contamination of the articular enclosure^[5].

2. Materials and methods

In order to carry out the following academic work, the documentary research method was used. This tool is based on the collection of documents, categorizing them, analyzing them and then presenting a coherent result. The objective of this methodology is to contribute new knowledge^[6].

It can also be said that this strategy is based on the systematic observation and reflection of theoretical and empirical realities, using various types of documents that serve to investigate, interpret, expose figures and information relating to the topic of science to be worked on. All this using instruments whose goal is to obtain results that can be the platform for another scientific exploration and the construction of new knowledge^[7].

Similarly, it can be listed in the following steps:

perform a process of scientific abstraction, generalizing on the basis of the fundamental; use the logical and mental procedures of all research such as analysis, synthesis, deduction, induction, among others; and it is due to an adequate collection of data, which allows rediscovering facts, suggesting problems, locating towards other sources of research, guiding ways to develop research instruments and develop hypotheses^[8].

In order to carry out this study, the documentary research methodology was used to gather the information necessary to obtain results, draw conclusions and provide recommendations. This is essential, since research implies knowing the background and the state of the art of the object of study. The background information refers to research already conducted on the subject, and whose results should be taken into account^[9].

This study was supported by bibliographic research, which allows, among other things, to avoid initiating explorations previously conducted, obtain knowledge of previous experiments to repeat them if necessary, search for suggestive data, complete interrupted or incomplete research, select materials and documents for a theoretical framework^[8].

With what has been exposed, it can be assured that in the present research work, a non-experimental documentary bibliographic review was used as a methodology, since a review and analysis of different medical and opinion articles referring to the prevalence of febrile convulsions was carried out, in order to be able to approach in the best way the use of the image intensifier in the extraction of radiopaque foreign bodies in traumatology.

3. Results

The advantages of fluoroscopic navigation are the reduction in surgical time and the amount of irradiation, from about 140 seconds without navigation to only 8 seconds, which makes a substantial difference. With regard to the duration of the procedure, it is 10 to 15 percent faster, which is key, considering that lengthening the surgical time increases the risk of infection. The source of pain is precisely identified and localized. The technique can be used throughout the body, and even patients with anatomical difficulties can be injected with

minimal risk. In addition, thin needles can be used, imposing less risk and improving patient comfort^[10].

Likewise, although this is a technique that has many benefits, the fact cannot be ignored that it works with radiation as it has been previously developed and that it has harmful effects for the patient's health when it is used at high doses or repetitively; it is related to pathologies such as cancer, fetal malformations, among others. Precautions must be taken into account prior to the procedure and at the time of performing it. It is also important to emphasize that this procedure should only be performed by professionals in the area with proven experience, in order to avoid adverse effects and complications.

4. Conclusions

In the case of a radiopaque object, it is essential to have an *image intensifier* to locate the *foreign body* during surgery, while in the case of a radiolucent foreign body, it is more advisable to locate it through the clinic, since these tend to form granulomas^[11].

Each clinical protocol must include the control of the dose administered to both the patient and the Occupationally Exposed Worker (OEW), the estimation of the maximum absorbed dose received by the patient, description of the type of intervention, registration of cumulative doses, among others. Interventionists must be trained to use the information of the skin dose and techniques to control the absorbed dose that may exceed 100 cGy (1Gy), taking into account that possibly the study may eventually be repeated, so it is advisable that any procedure is recorded in the clinical history and thus be able to optimize the practice by making an adequate follow-up of these cases^[12].

5. Recommendations

The risk of infection and different complications increases as the foreign body remains inside the body longer as it can drag fragments of clothing, skin and hair inside. This is why early resolution and removal of the foreign body is so important.

The radiation dose received by the patient is

high when the fluoroscopy study is performed. Therefore, the use of this medical technique is limited to specific and necessary cases only.

References

1. Romo R. Intensificadores de imagen (Spanish) [image intensifiers] [Internet]. 2010. Available from: <http://dea.unsj.edu.ar/imagenes/recursos/Rx-Intensificadores.PDF>.
2. Camacho D. Fluoroscopía en quirófano: Vías biliares (Spanish) [Fluoroscopy in the operating room: Biliary tract]. Buenos Aires: Universidad Nacional de San Martín; 2003.
3. Martínez A. Radiología: De la imagen convencional a la digital (Spanish) [Radiology: From conventional to digital imaging]. Buenos Aires: Universidad Nacional de San Martín; 2006.
4. Xunta de Galicia. Primeros auxilios (Spanish) [First aid] [Internet]. 2016. Available from: <http://www.edu.xunta.gal/centros/iespintorcolmeiro/system/files/5.CUERPOS+EXTRA%C3%91OS.pdf>
5. Rodríguez C, Zazo M, Pareja L, *et al.* Foreign body injury into the knee: A case purpose. *Revista Española de Cirugía Osteoarticular* 2005; 40(223): 2–4.
6. Sampieri R. Metodología de la investigación (Spanish) [Investigation methodology]. Mexico DF: Interamericana Editors; 1998.
7. Martínez S. Guía de apuntes básicos para el docente de la materia técnicas de investigación (Spanish) [Guide of basic notes for the teacher of the research techniques subject]. Oaxaca: Grupo Emergente de Investigación Oaxaca; 2002.
8. Rodríguez S. Acerca de la investigación bibliográfica y documental (Spanish) [About bibliographic and documentary research] [Internet]. 2013. Available from: <http://guiadetesis.wordpress.com/2013/08/19/acerca-de-la-investigacion-bibliografica-ydocumental>.
9. Parraguez S, Chunga G, Flores M, *et al.* El estudio y la investigación documental: Estrategias metodológicas y herramientas TIC (Spanish) [Documentary study and research: Methodological strategies and ICT tools]. Chiclayo: EMDO-COSEGE S.A.; 2017.
10. Prieto A. Fluoroscopía (Spanish) [Fluoroscopy]. Silicon Valley: National Center for Health Technology Excellence; 2010. p. 5–7.
11. Sánchez J. Manual de Especialidades quirúrgicas (Spanish) [Manual of Surgical Specialties]. Madrid: Palex Medical; 1992.
12. Rivas V. Comparación de la Dosis Absorbida en Piel de Pacientes Sometidos a Estudios de Hemodinamia en Equipos con Intensificador de Imágenes y Flat Panel con películas radiocrómicas (Spanish) [Comparison of the dose absorbed in the skin of patients undergoing hemodynamics studies in equipment with image intensifier and flat panel with films]. Universidad Central de Venezuela: Saber UCV; 2017. p. 25–40.