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The Efficiency of Applying the Radiology Technologist of the Radiation Dose Monitoring Technique During the Fluoroscopy Procedures for Oncology in Paediatrics Care Aged Between 4 to 7 Years

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Abstract

Fluoroscopy is one of the radiation sources used in diagnostic processes in radiology. Owing to the diagnostic approach that entails observation of the affected anatomy using radiation in real time, harmful effects may potentially occur. Therefore, safety measures in the radiographer's use of equipment and effective monitoring and management are essential in diagnostic processes. Additionally, patients in the age group of four to seven years have less anatomy and tissue development, which presents higher levels of health risks. The study will focus on analyzing the pre-procedure requirements and the set of guidelines, which enable the enforcement of the safety of the concerned patients within the paediatric practice. For example, the study will observe the potency of undertaking the reduction of the fluoroscopic times and improving the communications between the health specialists. The study will also evaluate methods and techniques employed in achieving efficiency in fluoroscopy radiation dose management. Direct and indirect methods will be employed to monitor the dosage effects. Direct methods would entail performing a skin dose test on the target area of fluoroscopic radiation. Detectors would be employed, for example the photographic films and thermo-luminescent dosimeters. The indirect methods will employ the use of the dose area product meter to ascertain the effects of radiation on the patients. Some of the dose reduction techniques involve the manipulation of equipment operation, for example beam quality adjustment, dose level setting, and dose spreading. The results used to evaluate the dosage level will entail analyzing measurements of the skin exposure unit of the fluoroscopic equipment. These results will be achieved through the use of different operational voltage levels on the fluoroscopic equipment. Skin dose will be determined through a combination of several measurable factors in fluoroscopic equipment operation.

Keywords: Imaging; Radiation; Medical imaging; Radiography; Paediatrics; Patient; Monitoring

Introduction

The use of fluoroscopy, which is a source of radiation in oncological radiotherapy, is a particular concern in paediatric medicine. This diagnostic technique entails the observation of the affected anatomy using radiation, and its use in children can carry some risks. It is therefore important that safety measures be considered when using fluoroscopy in a paediatric setting. Moreover, effective monitoring and management are critical in the diagnostic and treatment process.

Similar to most radiation techniques, fluoroscopy carries the risk of high radiation doses, especially during complex interventional procedures that require fluoroscopy to be administered for long periods. Young patients between 4 and 7 years of age have less anatomical tissue development and thus present with higher potential health risks when radiotherapy techniques are used. Accordingly, the monitoring of radiation dosages and time is of paramount importance in children.

Background

Fluoroscopy is a medical imaging technique that shows a continuous X-ray image on a monitor so that the movement of body parts can be seen in detail. Fluoroscopy is therefore highly beneficial as a diagnostic tool. However, during a fluoroscopy procedure, an X-ray beam is passed through the body. Owing to the radiation effects of these beams, the safety of fluoroscopy has been questioned, especially in paediatric cases. The radiation doses patients receive therefore needs to vary depending on their individual circumstances to minimize the risks of fluoroscopy. Notwithstanding, its use in children can result in radiation-induced injuries to the skin and underlying tissues that present shortly after exposure.

Purpose

Owing to the potential negative health implications of fluoroscopy among children and to increase its safety index, it is important that the pre-procedure requirements be analyzed before administering radiotherapy. Additionally, radiologists must review the guidelines set for fluoroscopy use in children to ensure the safety of their paediatric patients during the procedure.

One of the most significant areas of focus in increasing the safety of fluoroscopy is the initial assessment. The aims of this assessment are to potentially reduce fluoroscopic times and to improve communication between health specialists, particularly while treating the paediatric population. Focusing on these areas can facilitate the adoption of the best methods and techniques required to achieve optimal fluoroscopy doses.

This study therefore analyzes the procedures used before and during fluoroscopy to determine how technicians can best reduce the harmful effects of fluoroscopy in children.

Method

To effectively assess the implications of fluoroscopy for paediatric patients, direct and indirect methods can be employed to monitor the effect of doses. Direct methods entail conducting skin dosage tests on the fluoroscopic radiation target areas using, for example, photographic films and thermoluminescent dosimeters.

Indirect methods on the other hand involve the use of dose area product meters to determine the radiation effects on patients. Other important methods comprise dose reduction techniques which involve the manipulation of equipment through beam quality adjustment, dose spreading and dose level setting to understand the effects of fluoroscopy on patients.

Although fluoroscopy can be used to diagnose cancer, it can also result in radiation-induced cancer. The use of both direct and indirect methods is essential to assess the safety index of the procedure and to determine the required dosage and time of fluoroscopy exposure.

Results

An evaluation of fluoroscopic dosage levels requires an analysis of the entrance skin exposure units obtained using fluoroscopic equipment. Moreover, the results obtained by changing the beam quality and the effects of these varying beams on the skin are similarly important for understanding the safety of fluoroscopy in children. These results can be obtained by altering the operational voltages of the fluoroscopic equipment. The optimal skin doses can therefore be determined through a combination of several measurable factors during the operation of the fluoroscopic equipment. Obtaining test results such as entrance skin exposure units are essential for determining the appropriate safety margins during fluoroscopy use.

There are fewer risks associated with direct monitoring, which makes it more effective compared to other methods. Nevertheless, efficient dose monitoring demands that adequately trained operators not only use the appropriate equipment, but also continually adhere to rigorous quality control procedures. The procedures and interventions must however never compromise the quality of imaging or the dose specification.

Conclusion

As a result of the widespread adoption of fluoroscopic radiation techniques in paediatric oncology diagnostics and treatment, it is essential that radiation doses be monitored to ensure the safety of both patients and clinicians. Both direct and indirect methods of monitoring fluoroscopy safety therefore need to be considered.

Owing to the risks associated with the use of fluoroscopy, it is essential that the technology be used with caution. To ensure its effective use and to maximize its benefits, fluoroscopy should only be administered by technicians who are well trained and have a comprehensive understanding of the implications of its use.