

Practical Guide To Quality Assurance In Medical Imaging

Commissioning and quality control of a dedicated wide bore 3T MRI simulator for radiotherapy planning

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Original Article

Abstract

Purpose: The purpose of this paper is to describe a practical approach to commissioning and quality assurance (QA) of a dedicated wide-bore 3 Tesla (3T) magnetic resonance imaging (MRI) scanner for radiotherapy planning. **Methods:** A comprehensive commissioning protocol focusing on radiotherapy (RT) specific requirements was developed and performed. RT specific tests included: uniformity characteristics of radio-frequency (RF) coil, couch top attenuation, geometric distortion, laser and couch movement and an end-to-end radiotherapy treatment planning test. General tests for overall system performance and safety measurements were also performed. **Results:** The use of pre-scan based intensity correction increased the uniformity from 61.7% to 97% (body flexible coil), from 50% to 90% (large flexible coil) and from 51% to 98% (small flexible coil). RT flat top couch decreased signal-to-noise ratio (SNR) by an average of 42%. The mean and maximum geometric distortion was found to be 1.25 mm and 4.08 mm for three dimensional (3D) corrected image acquisition, 2.07 mm and 7.88 mm for two dimensional (2D) corrected image acquisition over 500 mm × 375 mm × 252 mm field of view (FOV). The accuracy of the laser and couch movement was less than ±1 mm. The standard deviation of registration parameters for the end-to-end test was less than 0.4 mm. An on-going QA program was developed to monitor the system's performance. **Conclusion:** A number of RT specific tests have been described for commissioning and subsequent performance monitoring of a dedicated MRI simulator (MRI-Sim). These tests have been important in establishing and maintaining its operation for RT planning.

Keywords: MRI in Radiotherapy; Wide-Bore 3T MRI Scanner; Radiotherapy Planning; Quality Control

1. Introduction

Computed tomography (CT) has been the primary imaging modality in radiation oncology over several decades due to its excellent spatial resolution, high geometric integrity, short exam time and the ease in establishing electron density information required for dose calculation.¹ However, magnetic resonance imaging (MRI) has a number of advantages over CT. CT in radiotherapy (RT) planning including excellent soft-tissue contrast and the use of non-ionizing radiation.²⁻⁴

MRI has been used in radiotherapy planning since the 1980s⁵, but images were usually acquired with a diagnostic scanner.⁶⁻⁸ In the last several years, MRI scanners that are designed for radiotherapy simulation purposes (also known as a MRI simulator or MRI-Sim) have become commercially available from several vendors.⁹⁻¹⁰ The dedicated MRI-Sim has several design features, which are unique and considered to be essential for radiotherapy treatment simulation such as a flat couch top, RT specific scanning protocols, an external laser system and flexible coils suitable for

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The authors provide guidance to implementing and running quality assurance programs in medical imaging departments. The treatment. Title, Practical Guide to Quality Assurance in Medical Imaging. Author, B. M. Moores. Publisher, Books on Demand. ISBN, , The authors provide guidance to implementing and running quality assurance programs in medical imaging departments. The treatment provides an overview of. This paper discusses the CD-ROM elaborated to provide a continuous professional formation and a practical guidance on the implementation and operation of. GUIDE. TO. QUALITY. ASSURANCE IN MEDICAL IMAGING PDF -. Search results, QPSD-D A Practical. Guide to Clinical Audit Page 3 of 86, iv GLL.2. Equipment for Diagnostic Radiography, Forster E, , MTP Press. 3. Practical Guide to Quality Assurance in Medical Imaging, Moores B et al, , Wiley &. QUALITY ASSURANCE MANUAL due to the importance of quality control in diagnostic imaging, I am required to ensure that The radiographic field shall be restricted to the area of clinical interest as far as practical. Introduction. The World Health quality assurance (QA) in medical radiological diagnosis as: an organized .. SHAW ET, PEARCY BJ, Practical Guide to Quality assurance in Medical. Imaging (John Wiley & Sons Ltd, UK,). 9.B. Image quality The results of image quality measurements in terms of limiting SA et al () Practical guide to quality assurance in medical imaging. medical imaging modalities should have a documented quality assurance (QA) program, .. Most countries also regulate the practical implementation .. harmonized approach to QA covering both technical and management. Quality assurance on imaging monitors: Design and implementation. Canadian Journal of Practical guide to quality assurance in medical imaging. New York. Digital subtraction imaging (DSI) systems. 13 The Code of safe practice for the use of x-rays in medical diagnosis (NRL rules (a quality assurance manual) wherever possible. 6 practical method for fluoroscopy examinations. Practical Veterinary Diagnostic Imaging is an essential and practical guide to the Clear guidance on the use of digital imaging to improve image quality and reduce Control of substances hazardous to health (COSHH) regulations Quality assurance for diagnostic imaging equipment General concepts of quality assurance and quality control Practical aspects of diagnostic radiology. Cardiovascular computed tomography (CCT) is a cutting-edge imaging technique providing important, non-invasive, diagnostic information. Concerns exist. A Practical Guide Valerie Andolina, Shelly Lille Quality assurance in mammography. Radiol Clin Haus A. Automatic film processing in medical imaging.

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