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BRIEF COMMUNICATION

Decommissioned Computed Tomography Gantry Modified into Play Equipment to Promote Child-friendly Imaging

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BACKGROUND

A distinct set of challenges is involved in imaging children.[1] Various imaging modalities require the patient to lie motionless inside a gantry. While this period is relatively short for a computed tomography (CT) study, it can be as long as 15 to 60 minutes for a magnetic resonance imaging (MRI) study. The experience of lying within the unfamiliar, enclosed structure of a gantry, while simultaneously exposed to loud and unpleasant noises, can be extremely overwhelming for patients. This is particularly challenging for young patients, and can result in uncooperative or disruptive behaviour. This behaviour results in lower imaging quality and increased stress among technologists performing the study; thus, the efficiency of imaging services is decreased.[1,2]

Depending on the age of the child, various techniques, including pharmacological and non-pharmacological interventions, can be employed to obtain high-quality images and prevent repeat examinations. Approximately 60% to 100% of children aged 4 to 6 years who undergo radiological examinations require some form of pharmacological intervention, such as general anaesthesia or sedation, in order to achieve motionless imaging.[3] Although adverse effects of general anaesthesia are rare, there are disadvantages (and costs), including the need for a team of anaesthetists, additional time required, and necessary space for care before and after the procedure. Therefore, it is prudent to minimise the use of sedation or general anaesthesia.[4] Non-pharmacological techniques include mock scanners, an attractive child-friendly environment, distraction techniques, preparatory videos, colouring books, virtual reality apps, assistance from child life specialists, or even trained animals.[5] These can play a role in decreasing, or in some cases, mitigating the need for sedation or general anaesthesia. However,

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in resource limited settings, there is little or no access to many of these techniques. We herein describe a novel method to introduce familiarity to CT or MRI gantries by modifying a decommissioned CT gantry into a play structure.

MODIFIED DECOMMISSIONED CT GANTRY

Design and Construction

The outer case of a CT machine referred to as a CT gantry, was selected for modification. The aim was to innovate it in such a manner that it would appeal to young children and be easily accessible to them. In consultation with engineering experts, it was modified into a slide, a play structure that most children are familiar with (Figures 1 and 2).

As part of the modifications, the working parts of the gantry were removed from the inside. Metal scaffolding was added to the base of the gantry to provide stability to the remaining light-weight structure. A short metal slide was positioned at the front, leading from the opening in the gantry, which became a 'tunnel' for the children. Small steps were placed at the opposite end of the opening. The height and size of the slide and steps were aligned to the CT gantry and welded to the modified shell. Because the slide and steps were quite low (approximately 60 cm), no side railings were required. The original light grey colour of the gantry was maintained, and the slide and steps were painted more brightly (green) to visually appeal to children. Some stickers were also added to the gantry enhance the visual appeal. The cost of the modifications was approximately US$150. The structure requires only regular external cleaning and incurs no other maintenance costs.

Safety

Safety was paramount. We ensured that there were

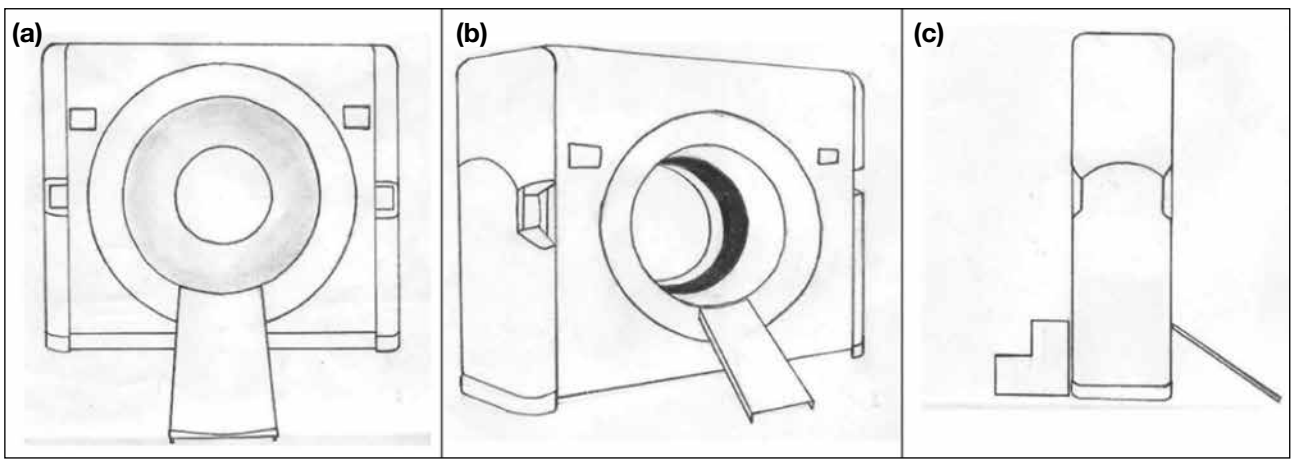

Figure 1. Schematic diagrams of a decommissioned computed tomography gantry modified as play equipment for children undergoing imaging procedures. (a) Front, (b) front-oblique, and (c) side views were used to aid the technical team during construction.

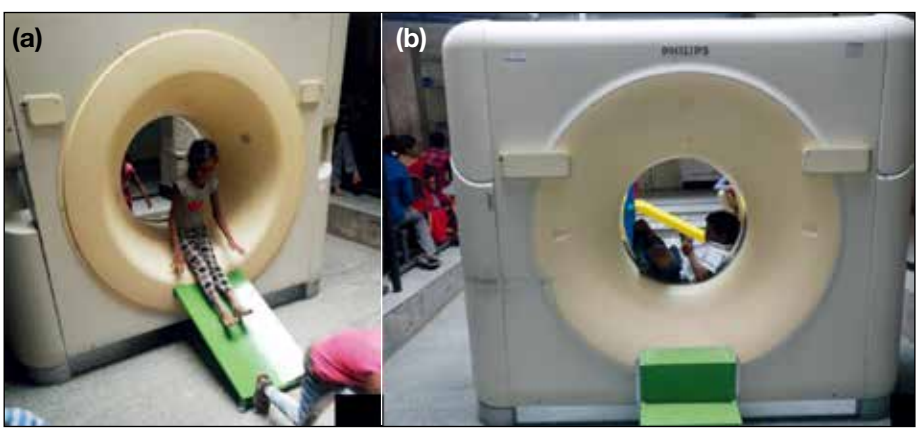

Figure 2. Photographs (a, b) showing children playing in the modified computed tomography gantry kept in the open patient waiting area.

no sharp objects or edges. Any small openings on the surface, where switches or other parts had been removed, were covered with plastic. The structure was stable and sufficiently heavy, so it did not require any additional fixing to the floor. Notices describing the apparatus were attached to the gantry, with a specific message addressing potential fears of parents that there were no active or radiation-emitting components, as well as instructions for use. As with all play structures, guardians are expected to supervise their children. The modified gantry was placed near the patient waiting area and was not monitored by staff, although the area was in view of a closed-circuit security camera. At the time of writing, the decommissioned gantry has been in use for >2 years. It is a very popular attraction that children queue to use. There have been no untoward incidents during this period, nor has the equipment required any repair.

Strengths and Limitations, and Comparison with Alternatives

To the best of our knowledge, this is the first time that a decommissioned CT gantry has been modified to a play structure to familiarise children to gantries. Barnea-Goraly et al[6] used a foldable toy tunnel, hat box, foam padding and a vibrating massage mat to create an inexpensive mock scanner for approximately US$80. The authors observed that the success rates for high-quality scans using a commercial mock scanner were not significantly different from using their economical play tunnel modification simulating the MRI environment, thus they recommended this modification for use in low resource settings. Compared with the toy tunnel of Barnea-Goraly et al,[6] our modified CT gantry is more realistic.

There are commercially available mock MRI gantry models, which include a moving table and audio output that simulates the noises and vibrations of an MRI experience. This setup requires a separate room with an electrical supply and operation by trained staff, which may not be feasible in resource- and space-limited settings.

A CT gantry was selected because it provides a life-size model of the imaging experience, but is smaller and more convenient for our purposes than an MRI gantry. Our centre retained the outer cover of a decommissioned CT scanner, but the necessary parts could be obtained from a third-party vendor. The parts required are substantially cheaper than a commercially available mock MRI gantry.

The modification of a decommissioned CT gantry into a familiar play structure is our centre's first attempt at creating such a prototype to aid child-friendly imaging. Further improvisation in the device could include battery-operated, automated commands within the gantry.

CONCLUSION

We have shared our experience in developing and converting a decommissioned CT gantry into a play structure which provides familiarity to children before undergoing imaging procedures. We believe this adds to the non-pharmacological strategies for child-friendly imaging, especially in situations where space and resources are limited. Further research is required to investigate whether this alternate calming method reduces the need for anaesthesia for children undergoing imaging procedures.

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