Guideline - Routine use of lead aprons and thyroid shielding on patients during Medical and Dental X-ray imaging

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Contents

Routine use of lead aprons during Medical Diagnostic X-ray

Lead aprons has been used for decades to optimize radiation dose to patients under the ALARA principle (As Low As Reasonably Achievable). However, due to the technological advancement in Medical imaging, routine use of lead aprons on patients may not be necessary. In fact, routine use of lead aprons may negatively affect x-ray image(s) as it may obscure anatomy which could result in inadequate diagnostic information or repetition of x-ray[1].

Most modern medical diagnostic x-ray equipment comes with Automatic Exposure Control (AEC) to adjust exposure factors (kVp, mA and time) depending on the size of the patient and position of the organ to be imaged. If lead shielding is present in the x-ray field of view, then it will automatically increase the AEC exposure factors (kVp, mA and time) which may lead to unnecessary increase of radiation dose to patients. Lead shielding is also unable to stop internal scatter within the patient, which is one of the major contributory factors for patient dose.

Unless the scan protocol is significantly modified, routine diagnostic x-ray and Computed Tomography (CT) scans usually deliver radiation dose much lower than the exposure associated with fetal harm[2]. There is no evidence showing that gonad exposures from routine diagnostic x-ray and CT scans, prior to conception increases risk of cancer or malformation of children[3].

If the patient is pregnant then special care needs to be taken during interventional radiology, or prolonged fluoroscopy of the pelvis and CT of the abdomen and pelvis which may involve a much higher radiation dose to the fetus and consequently an increased risk to the fetus. Referring medical practitioner must ensure that pregnancy status of women is established, informed consent is taken from the patient prior to the exposure, and the exposure is justified based on the history and clinical indication. Medical Radiation Practitioner (i.e. Diagnostic Radiographer) must ensure that the exposure is optimized in such instances.

Considering above factors, the routine use of lead aprons is not recommended unless deemed necessary by the Referring Medical Practitioner or Diagnostic Radiographer, or if specifically requested by the patient or their carer. Occupationally exposed radiation workers should continue to wear lead aprons as per the existing protocol and approved Radiation Management Plan of the practice.

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[1] AAPM Position Statement on the Use of Patient Gonadal and Fetal Shielding(PP 32-A, 2019)

[2] Committee opinion no. 723: Guidelines for diagnostic imaging during pregnancy and lactation. American College of Obstetricians and Gynecologists (ACOG) Guidelines 2017;130(4):933-934.

[3] International Commission on Radiological Protection. Pregnancy and medical radiation, Publication 84. Annals of the ICRP 30;1; 2000.

Routine use of thyroid shielding during Medical Diagnostic X-ray

The thyroid gland is one of the more radiosensitive organs in the head and neck region. It is frequently exposed to primary and scattered radiation during medical and dental x-ray imaging depending on the region of scan. Diagnostic CT scans and other diagnostic radiographic procedures may produce clinically relevant radiation dose to the thyroid depending on the exposure factors and scan region[4]. Thyroid shielding was found to reduce radiation doses by 45% during head CT and is strongly recommended, especially in younger age groups[5].

Radiation dose to thyroid may be optimized in variety of ways:

- Use appropriate protocols based on clinical indications. Exposure factors should be optimized for adults and children, and scan region should be limited as per clinical indication.
- Use thyroid shielding during scan if it does not interfere with the efficacy of the exam.
- Multiphase CT scanning should be avoided unless they are expected to provide additional diagnostic information.

Routine use of lead aprons and thyroid shielding during Dental X-ray

- Lead aprons do not provide additional protection to gonad and fetus from scattered radiation during dental x-ray imaging due to the distance of these organs from the mouth. There is no evidence to justify routine use of lead aprons for dental radiography unless specifically requested by the patient.
- Thyroid shielding may be used if the thyroid is in line with the primary beam, especially for children.
- In cephalometric radiography, thyroid protection may be necessary if the beam collimation does not exclude the thyroid gland[6].
- Thyroid shielding should not be necessary for OPG and CBCT scans as the thyroid should be excluded from the field of view during OPG and CBCT scans.

It should be remembered that thyroid shielding will introduce scatter radiation which may reduce the efficacy of the x-ray examination. Care needs to be taken to position the thyroid shielding to ensure that it does not interfere with the requested diagnostic information. Every effort should be made to avoid repeat examinations.

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[4] American Thyroid Association , Policy Statement on Thyroid Shielding During Diagnostic Medical and Dental Radiology(AAT, 2013)

[5] Beaconsfield, T., R. Nicholson, A. Thornton, and A. Al-Kutoubi. 1998. Would thyroid and breast shielding be beneficial in CT of the head, Eur Radiol 8:664-7.

[6] European guidelines on radiation protection in dental radiology- The safe use of radiographs in dental practice (EU, RP 136, 2004)