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# "Monday Morning Pearls of Practice by Bobby Baig"


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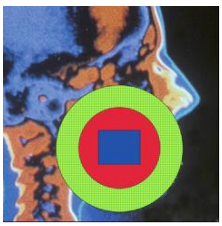
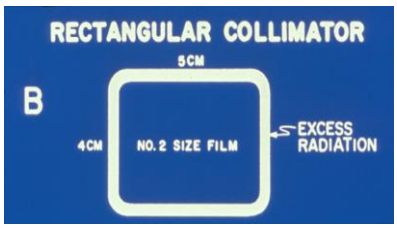
## Rectangular Collimation in Dental Radiography

**Introduction:**

1. Two shapes of collimators are available for intraoral radiography: circular and rectangular.
2. Rectangular collimation is most effective in reducing patient radiation as compared to round collimation because the incident beam and therefore irradiated region on the patient's face corresponds to the size and shape of the rectangular dental image receptor.
3. Rectangular collimation also improves image contrast by absorbing and reducing the scattered radiation.
4. Rectangular collimation is an extremely effective method for reducing the radiation dose from intraoral radiography.
5. Even the smallest round cones expose about twice the area needed to completely cover a typical bitewing or periapical receptor.
6. Collimation means restriction of the x-ray beam to a certain size as per federal law. This is done by means of a collimator, either at the end of the tube head or at the end of the beam indicating device (Cone).
7. The beam needed to be collimated to be a circle at the patients' skin no greater than 7cmm or 2.75 inches in diameter.
8. Rectangular collimation is a further restriction of the beam size to approximately the size of a # 2 periapical film or similar sized digital sensor.
9. Rectangular collimation has been widely available for many decades but has not found significant acceptance in the majority of educational institutions.



**Advantages of rectangular collimation: 2 major advantages:**

A**): Reduction of radiation dose to patient:**
The absorbed doses as published is One microgray equals to 0.1 millirads. When going from the round cone to rectangular cone, the overall absorbed dose for the FMX can be reduced by 200-300%. Rectangular collimation reduces the dose to the area six-fold. It may also be said that the rectangular collimation delivers about the same radiation dose as 4 bitewings using a round BID.

**B): Increased contrast and clarity:**
The rectangular collimation reduces scatter radiation there by increasing the contrast. Scatter radiation adds unwanted and non-diagnostic scattered photons of radiation to the image and, this in turn, produces a degradation in the inherent image quality by decreasing the contrast.

Proper collimation restricts the amount of primary radiation to the patient for periapical and BW radiography, rectangular collimation should be used whenever possible because a round field beam used with a rectangular image receptor produces segments of the beam circle that are not used in receptor exposure, which causes unnecessary radiation exposure to the patient.

**Proper Beam Filtration Setting:**
The most judicious use of filtration involves selective filtration of excessively high-energy and excessively low energy radiation. A kilovoltage best suited to the diagnostic purpose should be used. The range of 70 to 100 kilovolt peak or kVp, is suitable for most purposes. A kVp below 70, however, can deliver unnecessarily high radiation doses. Within this range, lower kilo voltages are associated with higher-contrast images, shorter grayscle, higher entrance skin doses, lower deep tissue doses, and lower levels of scattered radiation. Higher kVp, associated with lower contrast images but a longer gray scale.

**Conversion of Existing Intraoral X-Ray Machine:**
There are three basic methods.

1. Use of a position indicating device with the round cone and which collimates the beam at the skin surface. This device is made of metal and is called the Masel Positioning Instrument.
2. Converting a round cone to rectangular collimation by slipping a collimator on the end of the round cone. The collimator itself will rotate at its base in order to properly align the now rectangular beam with the film/sensor.
3. Use of a rectangular cone or BID.

**Devices for Rectangular Collimation Conversion:**
Several devices are available from the local dental dealers:

1. Masel film holder and positioning device.
2. Rinn rectangular collimator
3. Margraf rectangular cone
4. IDI Try image retrofit kit.

**Cone Length:**

1. Long cones 40 cm/16 inches as opposed to short ones 20 cm/8 inches were preferred in the past, due to decreased image distortion and increased resolution. Sixteen inch cones are too long and hardly used anymore.
2. Modern cone units are about 8 to 9 inches long. This is because of the recessed X-ray tubes inside the cone heads and also smaller focal spots, the area that X-rays originate from.
3. Focal spots in modern machines are about 0.4 mm compared to 2 mm in old machines.
4. Rectangular collimation as opposed to round collimation significantly lowers the exposure to the patient, limiting the X-ray beam to a size that is just a little larger than dental image receptor size two.
5. The collimator can be added to the cone or it could be part of the receptor holder.

**Conclusion:**

1. Rectangular collimation should be implemented in dental schools so students can learn about its significance and technique modifications for intraoral radiography.
2. Rectangular collimation should be promoted in dental diagnostic intraoral imaging as it reduces a patient's exposure to X-radiation.
3. However, operator training is necessary because there is little margin for error with this type of collimation.
4. Misalignment may cause cone-cut errors that may require retakes if critical diagnostic information is lost, which would defeat the purpose of using this technique for reducing exposure.

5. It has been shown that the universal rectangular collimator used alone is more effective at reducing thyroid exposure than a thyroid shield used with circular collimation.

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