

3. Discuss the radiotherapeutic gains and losses following the deployment of new technology for:
- 1a. Wedging: fixed v dynamic
 - 2b. Field shape: blocks v multileaf collimator
 - 3c. Port imaging: films v electronic images

- a) Fixed wedges are usually made out of steel or lead triangular blocks, mounted on plastic trays. It is placed in front of the beam, to attenuate radiation at one field edge preferentially over the other, to tilt the isodose curves.
A dynamic wedge, produces a tilt in the isodose curves the same way, but by moving the jaws across the beam in a controlled manner.

Gains with dynamic wedging

With dynamic wedging, there is no handling of a physical/ fixed wedge.

There is no beam hardening effect as seen with fixed wedges

Out of field scatter with dynamic wedges is reduced. This is useful in treatment with tumors such as breast cancer, when scatter to a contralateral untreated breast may be of concern.

Losses

More complex to measure isodose data from a dynamic wedge

subject to mechanical failure

- b) Shielding blocks are commonly made out of lead. Unlike wedges, they are of uniform thickness and are designed to block the passage of beams. Again they are mounted on plastic trays, and placed above the patient to modify field shapes.
Multileaf collimators (MLC) consist of a large number of smaller blocks of leaves, located in the head of a linear accelerator, which can move independently to generate a field of almost any shape.

Gains with MLCs

Blocks are made out of lead and can be heavy. They have to be mounted between treatment head and patient. This can cause injury to staff lifting blocks. Also blocks may fall on patient during treatment, injuring patient.

Speed of shape formation

A typical MLC consists of 80 or more leaves, allowing for more complicated field shapes to be created, than conveniently available with blocks. This is not correct because blocks allow all shapes, whereas MLC shapes are stepped and restricted in multiple concavities.

Losses

Physical penumbra is larger in MLC than with blocks [this is not correct for all linacs, only varian. Both Elekta and Siemens MLCs are focused with normal penumbra]. This is important when treating smaller fields or blocking is required close of critical structures.

Jaggedness of field edges with MLC makes it difficult to match adjacent fields.

There is also interleaf leakage with MLCs.

With MLCs, you cannot shield the centre of a treatment field in isolation, which is possible with blocks.

- c) Portal imaging is used to verify treatment accuracy and setup

Gains with electronic imaging

With port films (whoa! What are the gains with EPI? You are answering a different question!), limitations include 1) viewing is delayed because of time required for processing so what you mean to say is "view is prompt because there is no need for processing – this answers the Q, can you see this?"

2) it is impractical to do port films before each treatment again, "the ease of image production makes it practical to do port films before each treatment"

Electronic imaging overcomes this by allowing instantaneous viewing of images on a computer screen, and can be easily viewed before treatment.

Images can be stored on computer, and no need to keep hard copies.

So what are the losses???