Radiological Equipment Techniques (Lec 7)

Grid Usage

1. Grid Usage

The radiographer needs to consider numerous factors when deciding the type of grid. Grids are not appropriate for all examinations. Grids are appropriate, when considering;

1- Contrast improvement.

2- Patient dose.

3- The likelihood of grid cutoff.

Radiographers typically have the following choices regarding using grids:

1- parallel and focused grids.

2- high- and low-ratio grids. 3- grids with different focal ranges, 4- whether to use a grid or not.

The choice for using a grid is based on:

1- The kVp necessary for the examination

2- The thickness of the anatomic part being examined.

See figure below: Image A without grid while image B with grid.

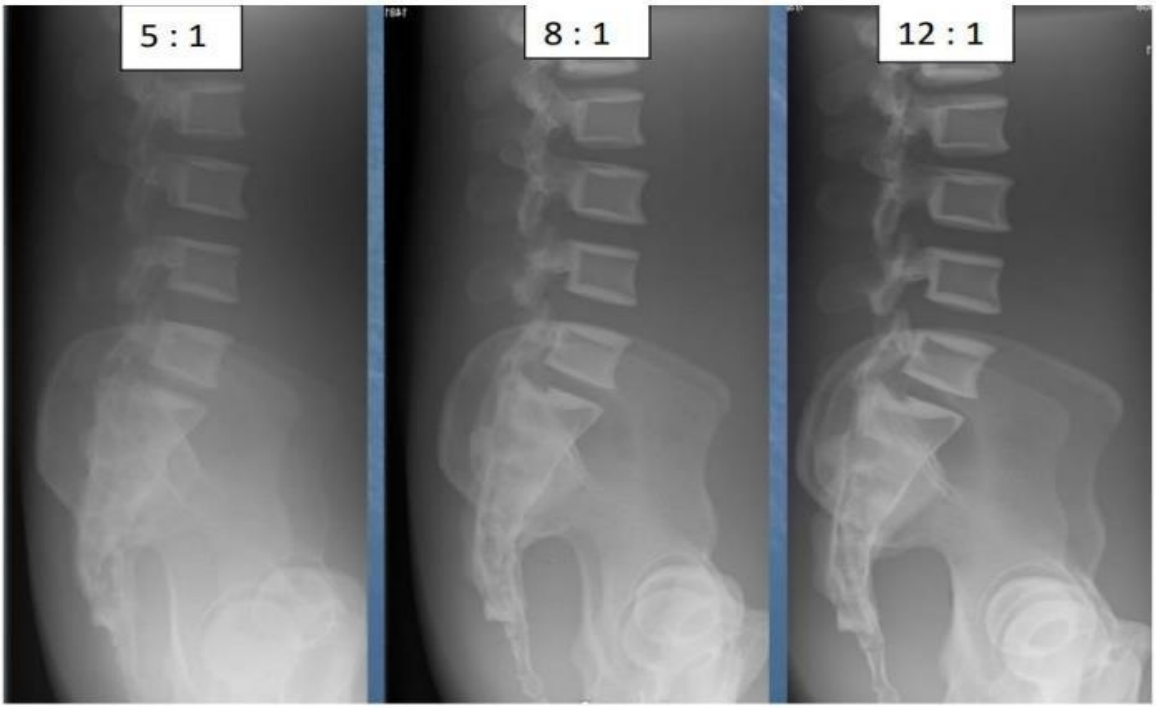
Parts thickness of 10 cm or larger, together with kVp values higher than 60, require using of a grid.

The next question is which grid to use. There is no single best grid for all situations.

A 16:1 focused grid ratio (high grid ratio) provides excellent contrast improvement, but the patient's dose is high.

The 5:1 parallel grid ratio (low grid ratio) does poor scatter clean up, especially at kVp values greater than 80. However, the patient dose is significantly lower.

In general, most radiographic rooms use a 10:1 or 12:1 focused grid (middle grid ratio), which provides a compromise/balance between contrast improvement and patient dose.



2. The Grid Conversion factor

The Grid Conversion factor (GCF), or Bucky factor, can be used to determine the required adjustment in mAs when changing from using a grid to nongrid.

The Grid Conversion factor $= mAs grid \,/\, mAs\ non\ grid$

Table below show the Grid Conversion factor for each grid ratio:

Grid Ratio	mAs Compensation
Non –grid	
5:1	2 (2 x non-grid mAs)
6:1	3 (3 x non-grid mAs)
8:1	4 (4 x non-grid mAs)
12:1	5 (5 x non-grid mAs)
16:1	6 (6 x non-grid mAs)

Example: (adding grid)

If a radiographer produced a shoulder radiograph with nongrid exposure using 3 mAs and then wanted to use a 12:1 ratio grid, what mAs should be used to produce the same exposure to the image receptor?

Solution:

Nongrid exposure = 3 mAs

GCF (for 12:1 grid) = 5 (from Table above)

The Grid Conversion factor = $mAsgrid$ / $mAs\ non\ grid$

5 = $mAsgrid$ / 3

$mAsgrid$ = 15

Example: (removing grid)

If a radiographer produced a knee radiograph using an 8:1 ratio grid and 10 mAs and on the next exposure wanted to use nongrid exposure, what mAs should be used to produce the same exposure to the image receptor?

Solution;

Grid exposure = 10 mAs

GCF (for 8:1 grid) = 4 (from Table above)

The Grid Conversion factor = $mAsgrid$ / $mAs\ non\ grid$

4 = 10 / $mAs\ non\ gri$d

$mAs\ non\ grid$ = 2.5

When removing an 8:1 ratio grid, mAs must be decreased by a factor of 4

(in this case to 2.5 mAs).

3. Changing between grids

The Grid Conversion factor (GCF) is also useful when changing between grids with different grid ratios.

When changing from one grid ratio to another, the following formula should be used to adjust the mAs:

mAs_1 / mAs_2 = **GCF_1 / GCF_2**

Example: (Decreasing the Grid Ratio)

If a radiographer used 40 mAs with a 12:1 ratio grid, what mAs should be used with a 6:1 ratio grid to produce the same exposure to the IR?

Solution;

Exposure 1: 40 mAs, 12:1 grid, GCF = 5

Exposure 2: _____ mAs, 6:1 grid, GCF = 3

$mAs1$ / $mAs2$ = GCF1 / GCF2

40 / $mAs2$ = 5 / 3

$mAs2$ = 24

Decreasing the grid ratio requires less mAs.

Example: (Increasing the Grid Ratio)

If a radiographer performed a routine portable pelvic examination using 40 mAs with an 8:1 ratio grid, what mAs should be used if a 12:1 ratio grid is substituted?

Solution;

Exposure 1: 40 mAs, 8:1 grid, GCF = 4

Exposure 2: _____ mAs, 12:1 grid, GCF = 5

$mAs1$ / $mAs2$ = GCF1 / GCF2

40 / $mAs2$ = 4 / 5

mAs 2 = 50

Increasing the grid ratio requires additional mAs.

4. Grid Selection

Notice that; As the grid ratio increases, patient dose increases; as the grid ratio decreases, patient dose decreases.

Decisions regarding the use of a grid and grid ratio should be made by balancing image quality and patient dose.

In order to keep patient exposure as low as possible, grids should be used only when appropriate and the grid ratio selected should be the lowest capable of providing sufficient contrast improvement.