

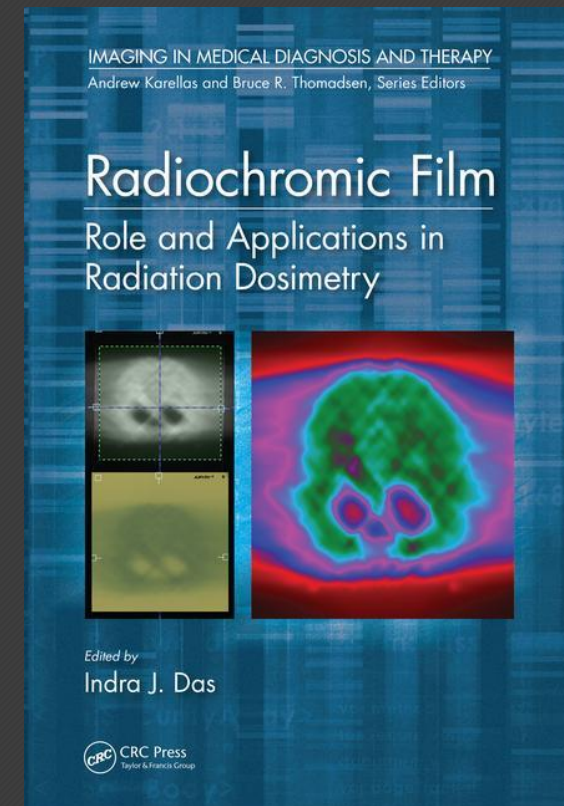
# Testing the performance of a ScanNCut system for radiochromic film preparation

Somayeh Zolfaghari, Kirby Francis, Tanya Kairn and Scott Crowe

# Radiochromic film

- Radiochromic film is amazing! High spatial resolution, near energy independent, near water equivalent, environment insensitive, 2D measurements!

Patient specific QA	✓
Small field dosimetry	✓
MLC characterisation	✓
Superficial dose measurement	✓
In-vivo dose verification	✓
Postal dosimetry audits	✓
Personal dosimetry	✓

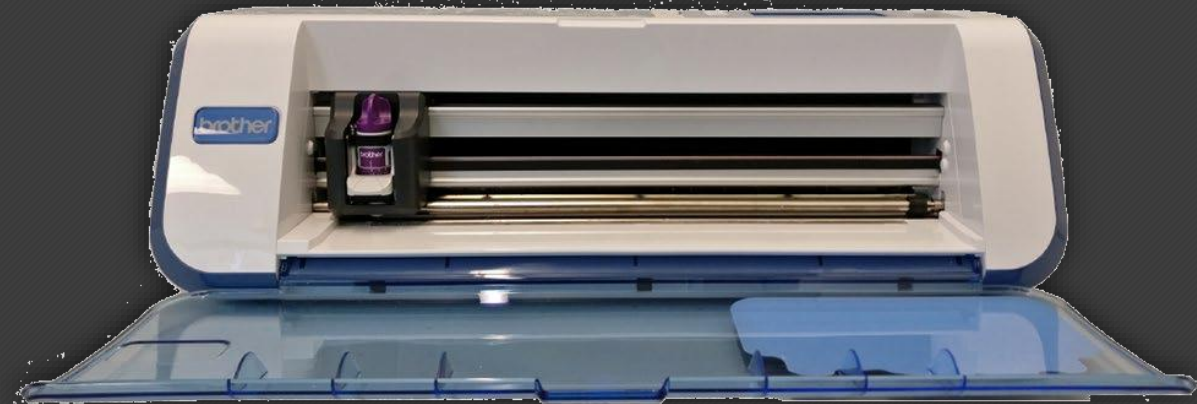


# Film cutting

- Film can be cut into smaller pieces, allowing efficient use of large sheets, and use in small or irregularly shaped phantoms
- Cutting results in damage at field edges
  - AAPM no. 63 suggests avoiding analysis within 1.5 mm of cuts
  - Others have reported 1-8 mm (Yu et al.), 1-3 mm (Mayers et al.)
- For EBT3, Moylan et al. recommended scissors only (no guillotine)
- Scissors are require handling, are time-consuming, are cumbersome for intricate shapes

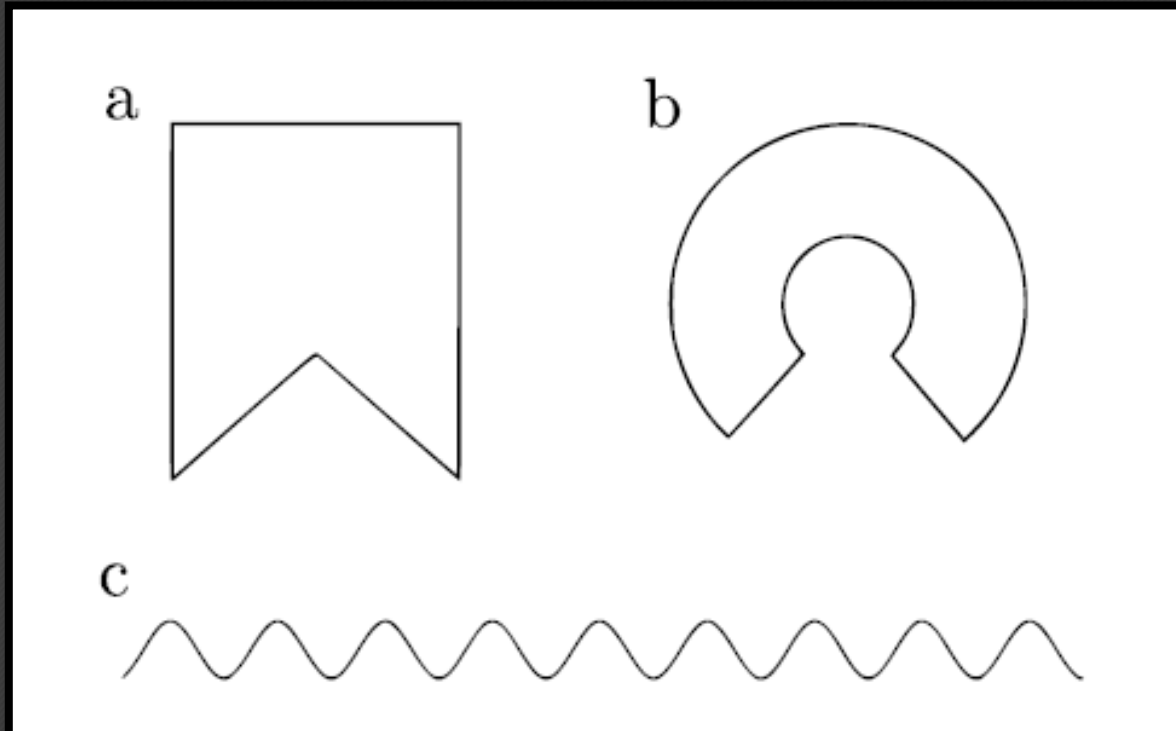
# Brother ScanNCut CM550DX

- Blades cut shapes in material loaded on adhesive work mat
  - 2 blades: standard and deep
- Designed for arts and crafts
  - used for ART and SCIENCE!
- Work area of 29.8×29.8 cm<sup>2</sup>
- Optical scanner (300 DPI) digitizes drawn or printed cutting patterns; which can be edited on touch screen panel



# Test patterns

swallow tail, C-shape, wavy line; to determine optimal system parameters (pressure, speed and extension)



CIRS 605 head phantom insert



# Method

- Evaluated performance of:
  - Scissors
  - Single-cut (pattern run once)
  - Double-cut (pattern run twice)
- Measures of performance:
  - Reliability of cut
  - Extent of delamination from cut edge
  - Time required
  - Accuracy compared to pattern



# Optimal parameters

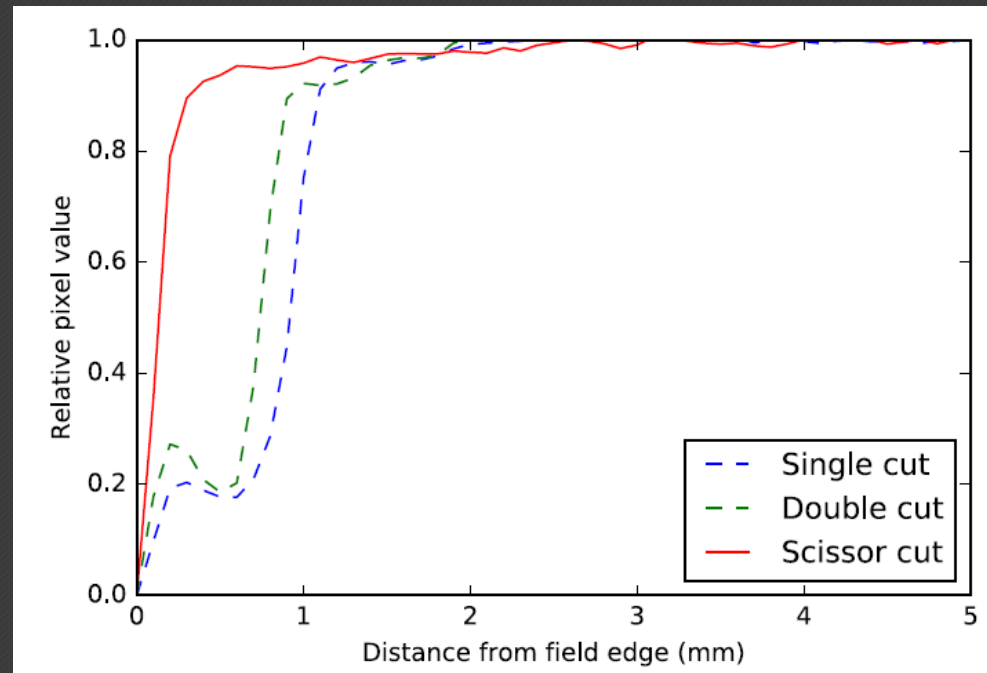
- Optimal operating settings determined for the broad swallowtail, C-shape and curvy line
- Double cutting more reliably cut through film entirely

**Table 1** Optimal operating settings, according to the shape to be cut

Cut	Blade	Blade scale	Pressure	Speed
Circular	Deep cut	$\geq 4$	5–7	1
	Standard	$\geq 9$	7–9	1
Angular	Deep cut	$\geq 3$	4–7	1
	Standard	$\geq 8$	5–6	1
Curvy line	Deep cut	$\geq 2$	5–7	1
	Standard	$\geq 9$	7–9	1
Overall	Standard	9–12	6–8	1

# Delamination effect

- Cutting system resulted in delamination further from the film edge
  - 1.8 mm for cutting system
  - 1.0 mm for scissors, in agreement with literature
  - Clinical impact is limited - literature recommends ignoring dose 1.5 to 2 mm from edge





# Benefits of film cutting system

- No deviations greater than 0.5 mm observed between pattern and cut film
- Holes for alignment rods handled easily
- Times for phantom insert:
  - Single cut = 21 s
  - Double cut = 45 s
  - Scissors  $\approx$  5 min (with marking and handling)



# Conclusion

- The system worked relatively well, but some features were less than ideal (adhesive work mat, for example)
- Some vendors and IROC use laser cutting - we are investigating cheap solutions
- You should hire Somayeh 😊
- And buy this text book!

