

# Application of 3D printed Breast Surgical Guide for Breast Conserving Surgery in DCIS Patients

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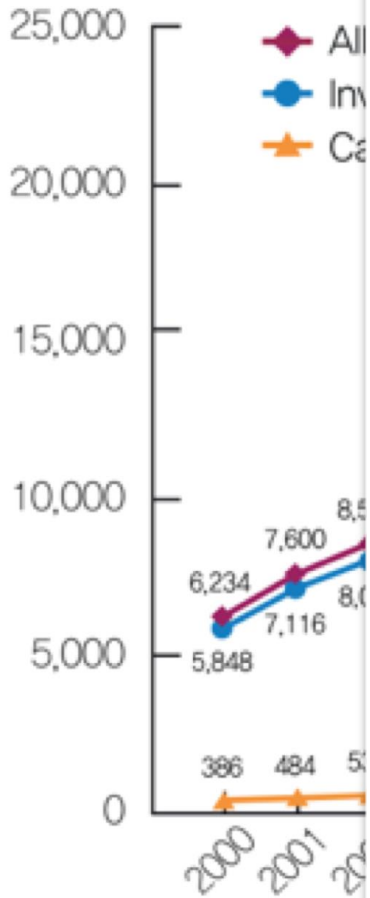
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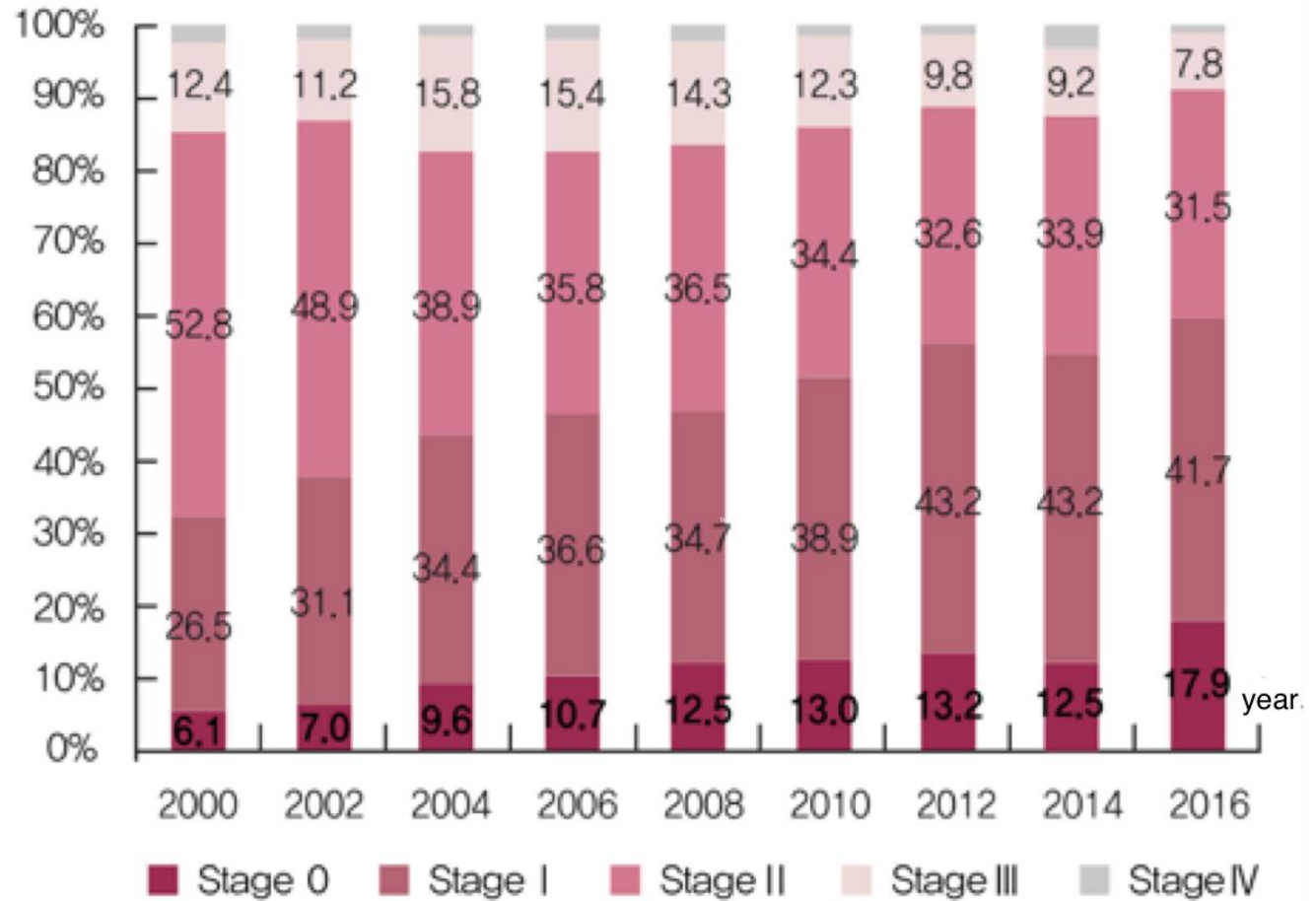
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# DCIS trends

Number of Patient



Percentage%



# DCIS extent

In many cases, DCIS is a non-palpable mass and accurate image measurement is important.




The accuracy of determining the DCIS extent varies with different modalities;

- MMG 87%-95%
- US 47%-71.3%
- MRI 73%-100%

*Journal of Cancer 2017*

# Methods to determine DCIS extent for surgical resection

TABLE 3: Rates of adequate margins and main disadvantages for each technique.

Technique	Rate of adequate margins	Disadvantages
Carbon marking	81.1%	Possible foreign-body reactions mimicking malignancy on follow up; obstruction of needle tip due to charcoal precipitation.
 Wire-guided	70.8–87.4%	Wire dislodgment; vasovagal episodes; pneumothorax.
 ROLL	75–93.5%	Possible widespread dispersal of the tracer by accidental intraductal injection; nuclear medicine department required; for experienced surgeons; expensive.
Clip marker	90–92%	Clip migration.
 US-guided	89–97%	DCIS rarely visible on US if not marked with a clip or hematoma.
Cavity shave	91.3–94.4%	Long operative times.
Imprint cytology and frozen section analysis	89–91%	Sensibility equal to 72–83%; possible difficult interpretation by pathologist due to presence of irregular specimen's surfaces or atypical cells; long operative times.

# Wire localization

- Displacement
- Difficult placement in dense breast
- Pain, Vasovagal syncope
- Pneumothorax
- Transection, loss of wire
- Interference with the surgical approach

*Archives of Surgery. 1988*

*European journal of surgical oncology. 1998*

*AJR. American journal of roentgenology. 1991*

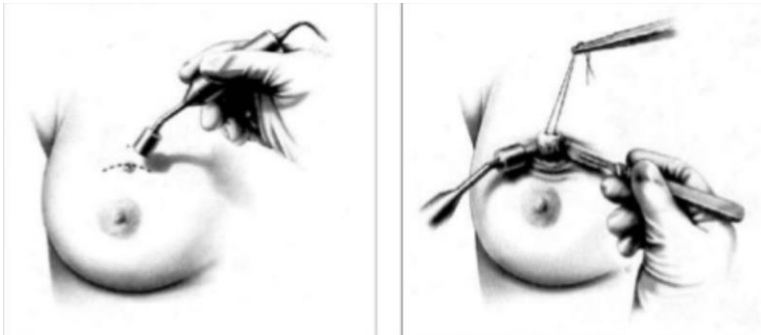
# Radio guided occult lesion localization (ROLL) / Radioactive seed localization (RSL)

- Clear margin rate ↑, Re-excision rate ↓,  
good cosmetic result ↑ convenience ↑

*J Surg Oncol. 2008*

*The breast journal. 2008*

*Annals of Surgical Oncology. 2001*

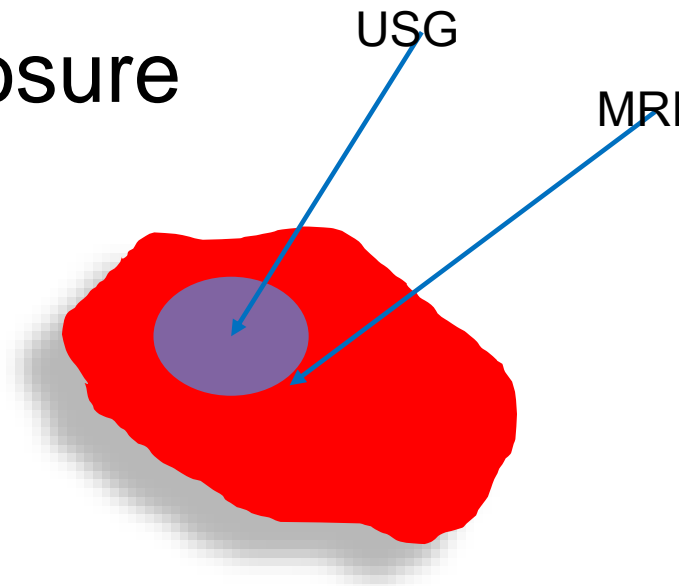


# ROLL, RSL / WL

- No significant differences in surgical margin, re-excision rate, reoperation rate, ratio of the tumor volume to initial surgical specimen volume, ratio of the tumor volume to total volume resected, or clinical in computed cosmesis scores. *American Journal of Roentgenology. 2015*
- No differences in positive margins rates, positive or close margins rates, specimen volume, weight, reoperation, and localization times  
*Annals of surgical oncology. 2011*

# Limitation: WL, ROLL, RSL

- MRI guide localization is difficult
- Difficulty with quantitative marking
- Migration
- Radiation exposure
- Loss
- Pain



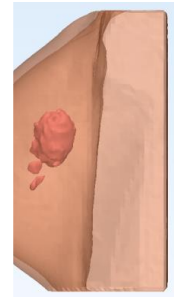
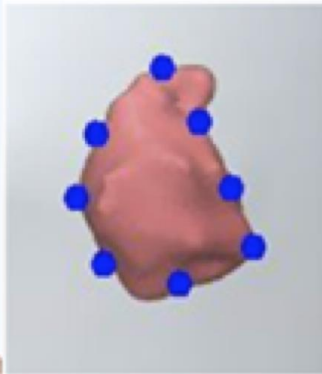
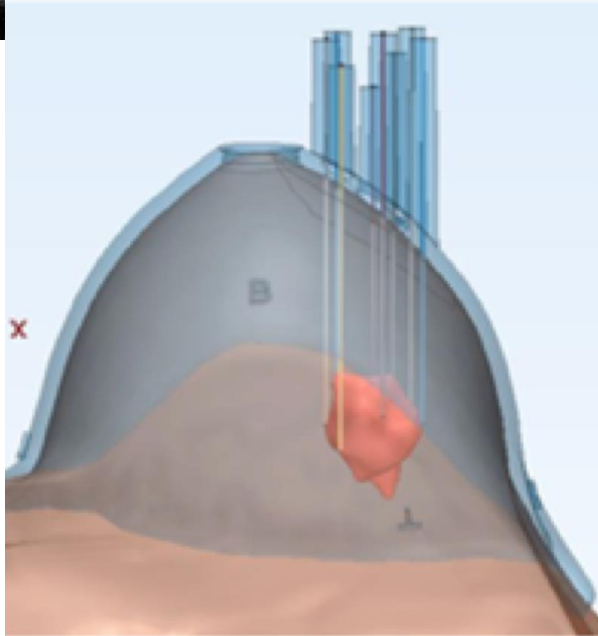
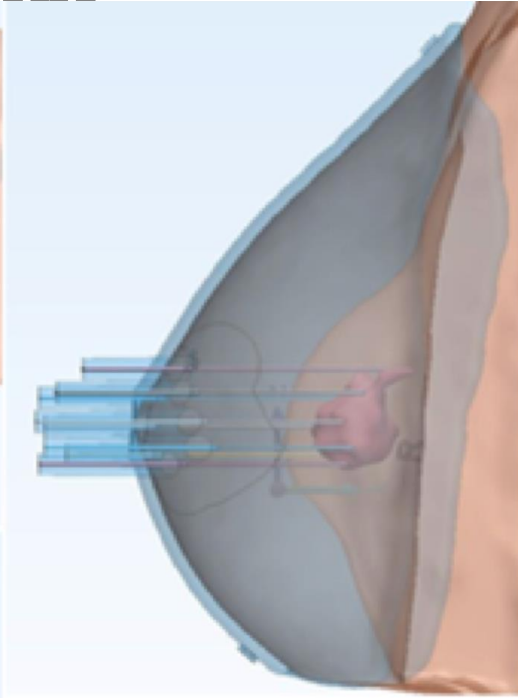
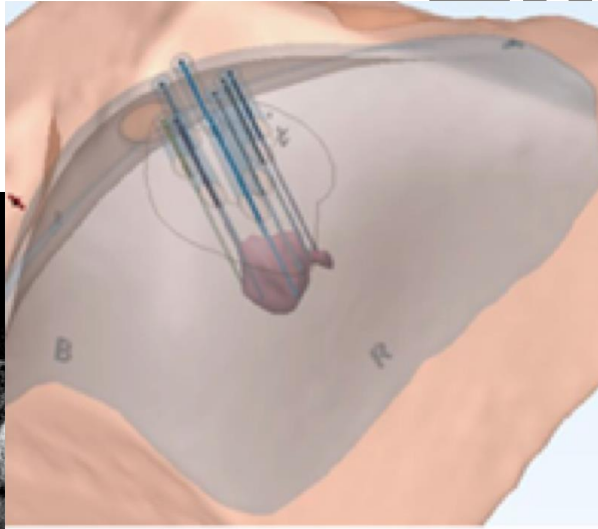
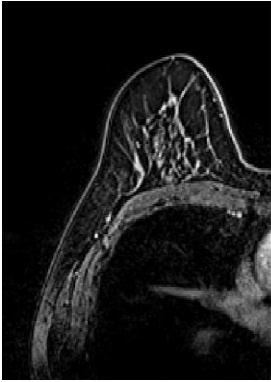
How do we target tumor?



# 3D guide !! idea

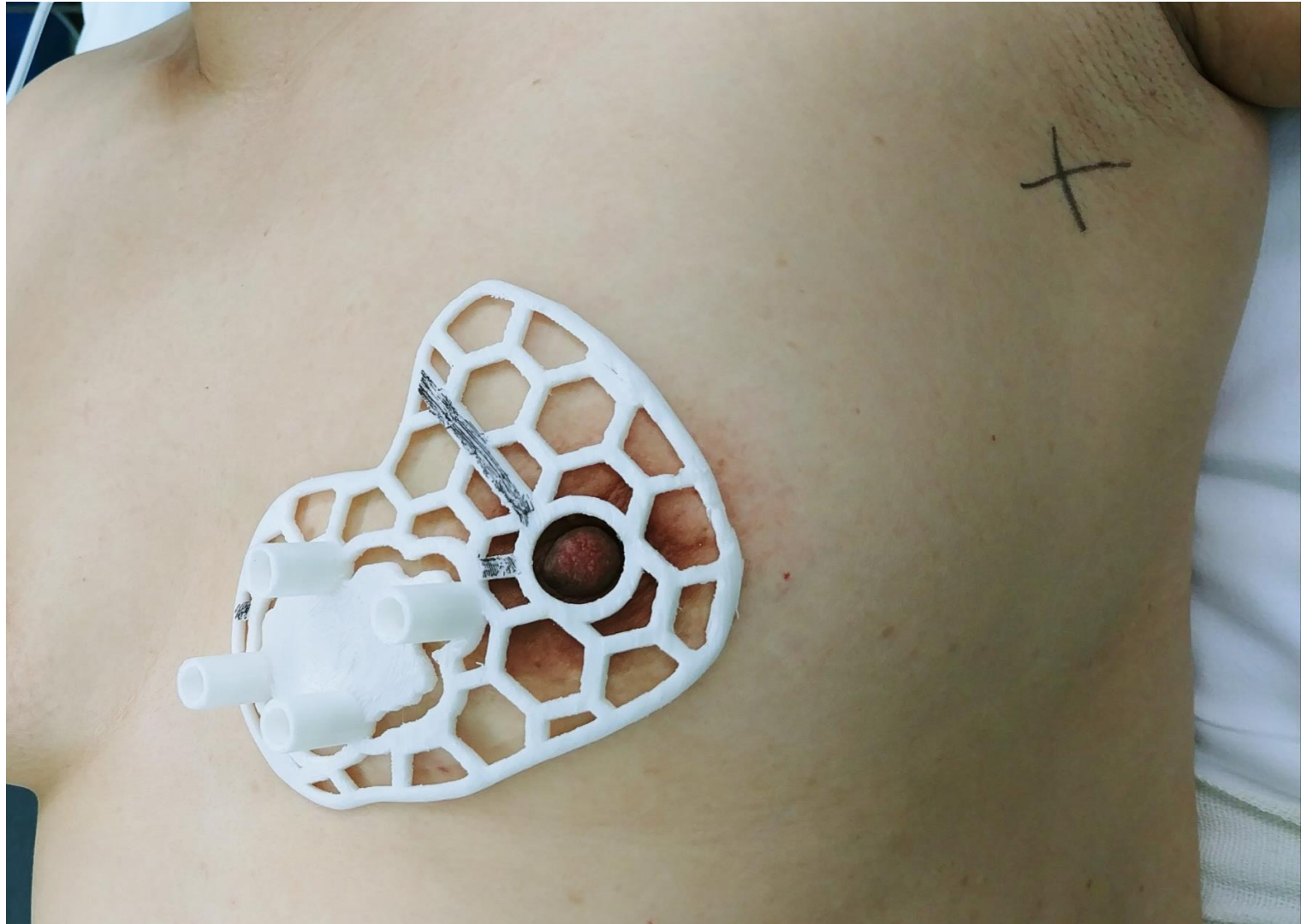
- Previously produced, operative time consumption > NO
- Injection after GA, Pain > NO
- No risk of Migration or dislodgment, NO radiation
- Quantitatively mark the area of resection using MRI information.
- Margin status!!!

# Flow



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# Version development





# Study-results

- 6 patients with DCIS
- Median age: 48 years
- Median Operative time: 53 min
- All patients had tumor free resection margins
- The median distance from the tumor to the margin was 10 mm (range, 1 to 20).

size(cm)	US	MRI	Path
Patient 1	0.6	0.8	0.7
Patient 2	0.4	0.5	0.6
Patient 3	0.8	0.7	0.5
Patient 4	0.9	0.9	0.6
Patient 5	2.6	2.2	2.5
Patient 6	1.0	4.8	0.8

# Summary

- 3DP-BSG is applied in six DCIS patients.
- All patients have adequate margin and tumors are completely removed.
- Limitation
  - ✓ Fewer patients
  - ✓ No investigation of removed volumes or cosmetic results

**Thank You**

