

High resolution ultrasound guided surgery (HUGS) of non palpable breast lesions is safe and can significantly reduce hook-wire guided surgery

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Goals: We studied the safety of intra operative high resolution ultrasound for the location and surgical removal of non palpable breast lesions (in situ carcinoma and invasive carcinoma < 15 mm) without hook-wire (6). Our goal was also to achieve a free margin of at least 5 mm at primary surgery.

Background: With breast cancer screening programs established in many countries, we detect far more non palpable tumors and in situ carcinomas as we did before the screening era. At "Breast Cancer Center Pirmasens", a partner of the "Mammography Screening Program Pfalz", nearly 50% of detected lesions are non palpable and would require hook-wire guided surgery.

Hook-wire guided surgery was introduced in 1980 by Kopans and DeLuca (2) to help locate occult lesions of the breast. The procedure is considered "gold standard" and is widely used. Hook-wire guided surgery is however time consuming and requires multiple mammograms. For this reason we established a standard procedure for high resolution ultrasound guided surgery (HUGS) of non palpable lesions of the breast and studied its safety and effectiveness in 125 cases.

Methods: Non palpable invasive lesions were selected for ultrasound guided surgery depending on their visibility in high resolution ultrasound (14 MHz). 125 lesions (invasive carcinomas from 3 to 15 mm and in situ carcinomas) were selected for this study (55.2% 11-15 mm, 44.8% 3-10mm and DCIS). High speed core biopsies or stereotatic biopsies in case of DCIS related micro calcification were performed up front. The site of incision was determined using the ultrasound probe under sterile conditions in the theatre. Breast tissue was surgically mobilized and repeatedly examined for the presence of the lesion and for free margins before removal. The correct removal of the lesions was examined by *ex vivo* tissue ultrasound and tissue radiographs using a tissue transfer and X-ray system (T-TRAX) developed at "Breast Cancer Center Pirmasens" (1, 4, 5) during surgery and confirmed by pathological examination of the tissue later.

Results: All 125 (100%) non palpable lesions (invasive carcinomas 3-15 mm and DCIS) were correctly located and removed by intraoperative high resolution ultrasound guided surgery (HUGS) without using a hook-wire marker.

88% of the lesions were removed with a free margin of at least 5 mm at primary surgery. Only 3,2 % of re-excisions (total 12%) were due to low margins for invasive carcinoma or both invasive carcinoma and DCIS. Our re-excision rate for low margins due to in situ carcinoma was 8,8 %.

Conclusion: High resolution ultrasound guided surgery (HUGS) of non palpable invasive breast lesions in experienced hands is a safe and accurate method which can significantly reduce the use of hook-wire guided surgery.

In Addition, *ex vivo* ultrasound and radiological examination of breast cancer tissue can help reduce the re-excision rate for low or positive margins significantly.

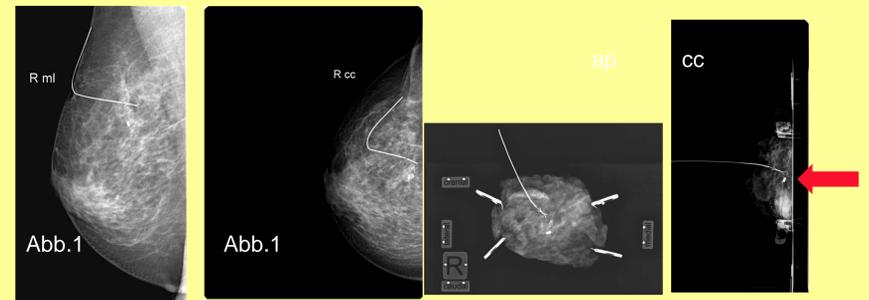


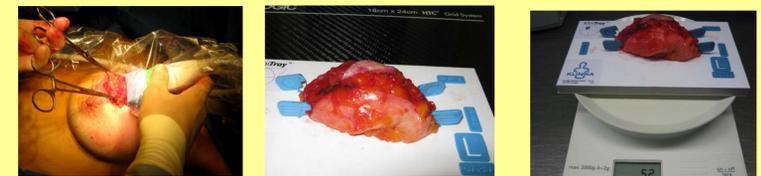
Abb.1) Hook wire guided surgery: Perioperative insertion (left) and tissue radiograms in ap and cc (right). Clip left in situ after stereotatic biopsy. Additional excision dorsal (arrow) during primary surgery for low margin dorsal.



Ultrasound probe

Locating the lesion by high resolution ultrasound

Mobilizing breast tissue



Scanning for tumor and for free margins

Safety pins and tissue on tray

Weighing the specimen



Performing Tissue radiograph anterior-posterior

Performing tissue radiograph cc

Scanning tissue radiograph for tumor and free margins



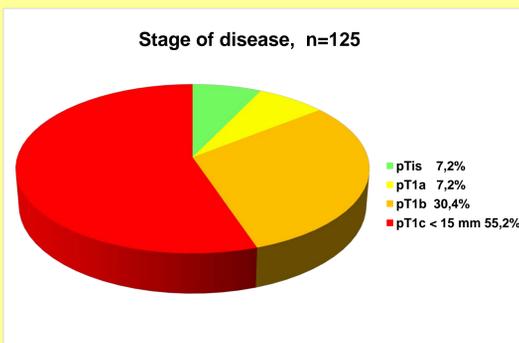
Tissue ultrasound scan

Invasive carcinoma 8 mm (red arrow)

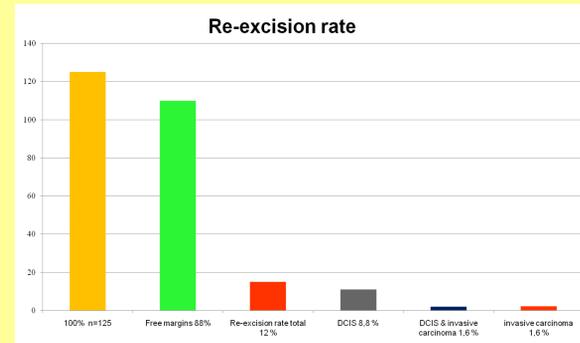
low margin due to DCIS ventral (blue arrow)



High resolution ultrasound guided surgery (HUGS) for in situ carcinoma. Metal clip (red arrow). Additional excision medial (tissue left on tray) due to micro calcification medial (yellow arrow) during primary surgery



Stage of disease in study population n=125



Re-excision rate for low margins (<5mm)

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