Early Experience of Ultrasound Guided Deployment of SAVI SCOUT® in Targeted Axillary Dissection for Breast Cancer in Singapore

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Purpose

In breast cancer treatment, targeted axilla dissection (TAD) in conjunction with sentinel lymph node biopsy (SLNB) to stage the axilla in node positive patients after neoadjuvant systemic therapy (NST) can reduce the morbidity of routine axilla lymph node dissection.[1] TAD is more accurate than SLNB alone in this scenario.[2]

A variety of methods can be used to target the pathologically-proven positive lymph node, including marking with a radioactive iodine seed and hookwire localization of tissue markers within the pathological lymph node.[3] However, there are various challenges with these approaches. There are logistical difficulties of strict regulation guidelines and appropriate disposal of radioactive substances. Regular tissue markers have poor visibility in the axilla especially when the pathological lymph node has resolved. There is also a potential risk of injury to surrounding neurovascular structures in the axilla during hookwire localization of the tissue marker or pathological lymph nodes.[4]

SAVI SCOUT® is a novel wire-free, non-radioactive device that uses radar technology for precise localization. The SAVI SCOUT® reflector can function both as a sonographically-visible tissue marker before NST and also a radar localizer intraoperatively using a handpiece and console system (Figure 1).[5, 6] We describe our early experience in a case series of its first ever use in Asia.

Figure 1. SAVI SCOUT® Guidance System (Images courtesy of Cianna Medical, Inc)
Hand piece and console system emit infrared light and electromagnetic wave signal, which are reflected back by reflector. This system allows more precise targeting, including distance from hand piece detector to the target.

Methods

A retrospective review of SAVI SCOUT® for TAD from July 2019 to July 2020 at Mount Elizabeth Medical Centre by a single surgeon was performed. The patients in this study had cT1-2 core biopsy-proven primary invasive carcinoma of the breast, with ipsilateral metastatic axilla lymphadenopathy. All patients underwent ultrasound guided deployment of the Savi Scout reflector into the metastatic axilla lymph node prior to commencement of NST. The Savi Scout system in this scenario functions both as a tissue marker as well as a localization device. Upon completion of NST, all patients underwent TAD. The technical performance and surgical outcomes were evaluated.

Results

There were 5 cases of TAD utilising SAVI SCOUT® (Table 1). All 5 patients presented with unilateral primary breast ductal adenocarcinoma, with biopsy-proven metastases in the axilla lymph node. The mean age was 52 years old and mean tumour size was 26mm. The reflectors were readily identifiable on various imaging modalities (Figures 2 to 3). All 5 patients then successfully completed their NST (mean 157 days).

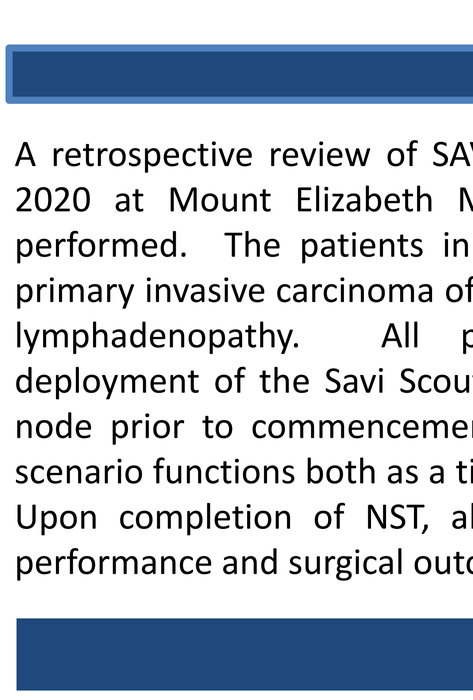

Figure 2.
(A) Mediolateral oblique mammogram shows the linear metallic reflector (arrow) with its characteristic thin antennae at either end, embedded within a metastatic axillary node. An embedded metallic clip is seen within the primary malignant mass in the upper half of the breast.
(B) Ultrasound axilla of demonstrates reflector (arrow) with an echogenic linear configuration located within the cortically thickened metastatic node.

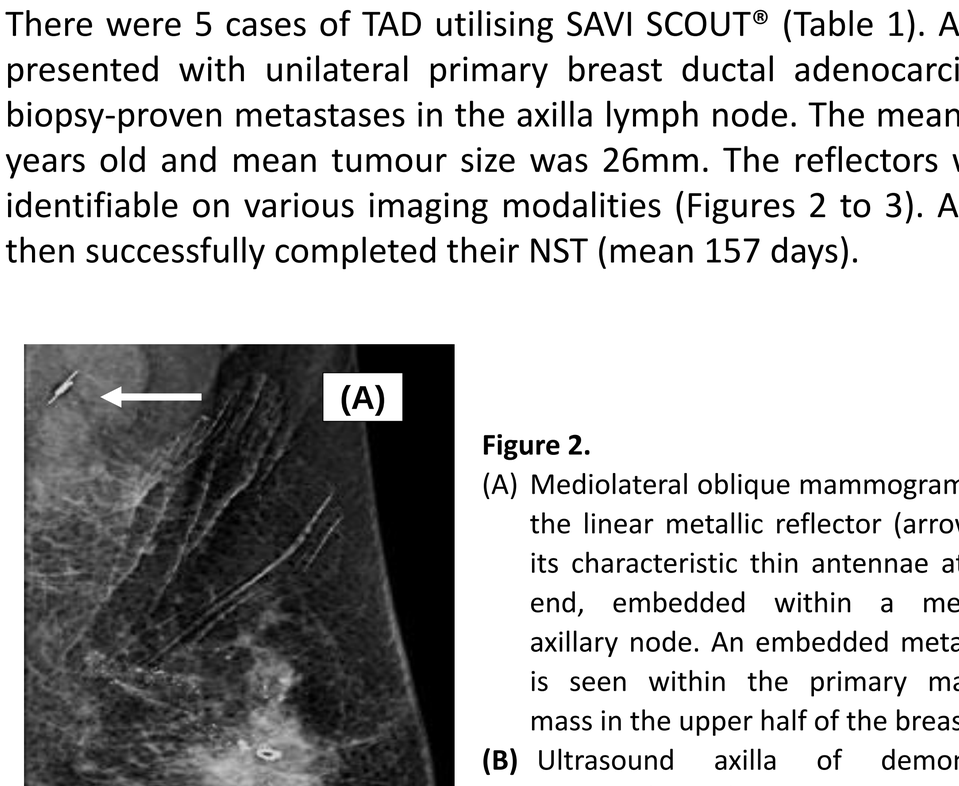

Table 1: Summary of Targeted Axillary Dissection Cases using SAVI SCOUT®

No.	Histological Subtype	Tumour size (mm)	Pathological lymph node size (mm)	Operation	Histology of TAD	Stage of Disease
1.	Ductal ER-/PR-/Her2+	40	28	WE + TAD + SLNB + ALND	Residual disease	ypTisN1$_{mic}$M0
2.	Ductal ER+/PR+/Her2-	38	40	SSM + TAD + SLNB + ALND	Residual disease	ypT2N3M0
3.	Ductal ER+/PR+/Her2-	28	8	WE + TAD + SLNB + ALND	Residual disease	ypT1N1M0
4.	Ductal ER+/PR+/Her2-	15	14	WE + TAD + SLNB	pCR	pCR
5.	Ductal ER-/PR-/Her2-	10	11	WE + TAD + SLNB	pCR	pCR

mic: Micrometastasis; LN: Lymph node; SSM: Skin sparing mastectomy; WE: Wide excision; TAD: Targeted axillary dissection; SLNB: Sentinel lymph node biopsy; pCR: pathologic complete response

Four patients had breast conservation surgery and 1 had skin-sparing mastectomy with immediate breast reconstruction. TAD was successfully performed in all cases, using dual technique (radiocolloid and blue dye) sentinel lymph node mapping and SAVI SCOUT® radar technology to localize the pathological lymph node. The SAVI SCOUT® reflector was successfully retrieved in all cases and confirmed on specimen radiography (Figure 4). There were no complications such as reflector migration. In 1 case, the pathological node containing the reflector was neither radioactive nor blue. Three patients had residual tumour detected during TAD and underwent axillary clearance.

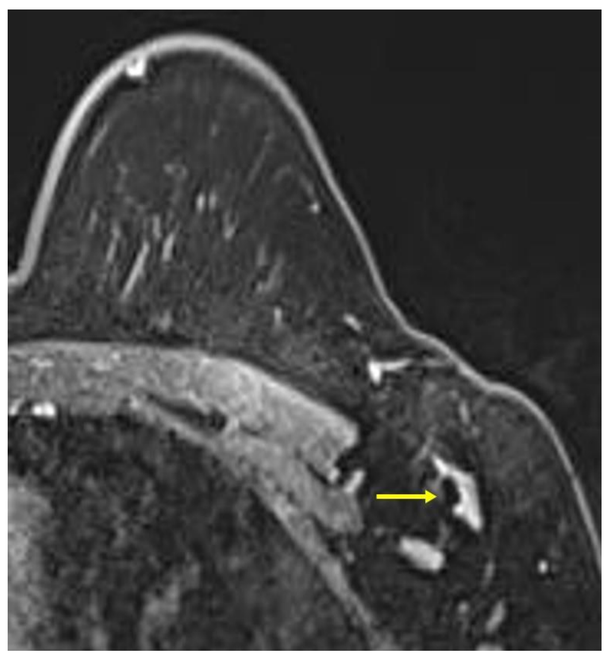

Figure 3. MRI axial T1-weighted, gradient echo, volumetric-interpolated examination, fat-saturated, post-contrast axial image: The reflector (arrow) was inserted in a metastatic left axillary node. It appears as a thickened linear hypointense object without significant blooming artefact. It did not obscure visibility of the underlying node.

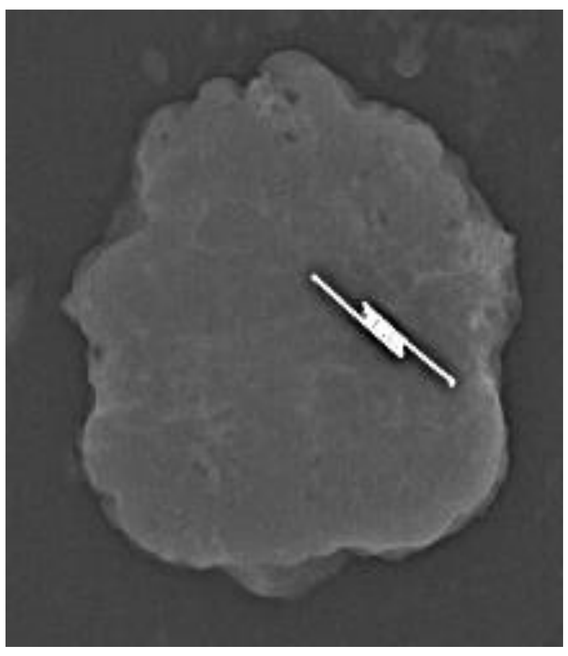

Figure 4. Specimen radiograph of harvested sentinel lymph node confirmed retrieval of the SAVI SCOUT® reflector which is a 12mm implantable, nonradioactive and infrared-activated electromagnetic wave reflector localised using a handheld probe

Prior to the availability of SAVI SCOUT®, TAD was performed with wire localization of the marked pathological lymph node by this same surgeon. SAVI SCOUT® system obviated the need for pre-operative wire localization, easing surgical scheduling, reducing patient discomfort, and eliminating potential problems with wire dislodgement during patient transfer. The reflector is used conveniently both as a tissue marker as well as a localizer. It is sonographically visible and easily deployed under ultrasound guidance.

Compared to wire localization, TAD using SAVI SCOUT® system was not more complicated and time taken to harvest the pathological lymph node was similar. However, the drawback of SAVI SCOUT® system is the risk of the radar signal being deactivated should there be an accidental contact of the reflector antenna with electrocautery. In practical terms, this is not a major issue because the lymph node would have been clearly identified by then. The SAVI SCOUT® system estimates the distance of the probe to reflector in millimetres so this problem can be avoided by more careful dissection when nearing the reflector. Another point to note is that the radar signal may temporarily not be detected if the reflector is deployed deep to a haematoma. This may happen if the reflector is deployed at the same time as core biopsy of the lymph node. If this happens, the deployment is easily confirmed with ultrasound as the reflector is sonographically visible. The radar signal will be restored a few weeks later during NST and does not pose a problem for surgery by the time NST Is completed. This happened in one of our five patients but did not hamper the TAD by the time of surgery.

Conclusion

Our case series demonstrated the reliability and advantages of SAVI SCOUT® in TAD which overcomes challenges associated with other modalities, such as radioactive seed or wire localisation. The ease of deployment and visibility under ultrasound is an additional advantage. Further extensions of its use may be considered in breast lesion localization under ultrasound or stereotactic guidance.

References
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