9th International Symposium on
Focal Therapy and Imaging in prostate & kidney cancer
June 23-25, 2016
Washington Duke Inn Hotel, Durham NC, USA

Within-core cancer localization - Implications on real-life prostate cancer management.

Michael Cohen[1], Boris Yudkevich [1], Helena Yodko [2], Irit Elmalah [2].
1] Dept. of Urology [2] Dept. of Pathology. Emek medical center, Afula, Israel.

Introduction & objectives

Currently, no biopsy technique, including 3D-image-guided-biopsies (3D-IGB) or template-mapping-biopsy (TMB) can accurately define the cancer foci location within the prostate. This is because when tissue cores are thrown into a formalin vial,- an inevitable 20-25mm uncertainty range (core length) is expected as the polarity of the core, its fragmentation pattern and the location of the cancer within it become unknown.
We examined the "real-life" significance of this inaccuracy by assessing biopsy procedures data, combining a semi-automated biopsy cores download system (SBx™) [fig.1] and a 3D-IGB TRUS system (Navigo™) (UC-care, Israel) [Fig. 2].

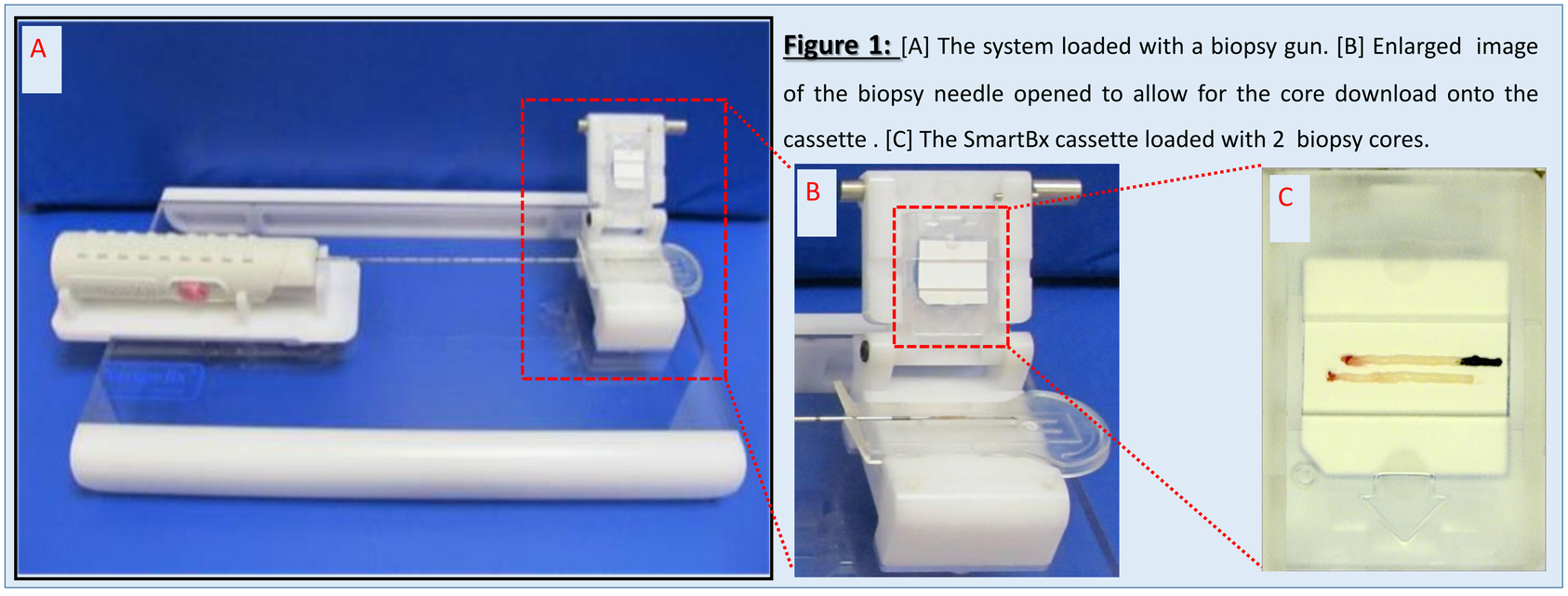


Figure 1: [A] The system loaded with a biopsy gun. [B] Enlarged image of the biopsy needle opened to allow for the core download onto the cassette . [C] The SmartBx cassette loaded with 2 biopsy cores.

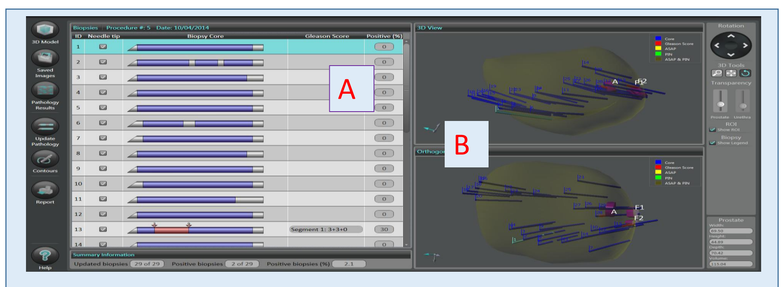


Figure 2:

Screen capture of the Navigo™- 3D guided biopsy workstation (UC-Care medical systems, Israel) showing -

[A] Biopsy log showing in-specimen cancer location (core #13) or core fragmentation (core #6) , and

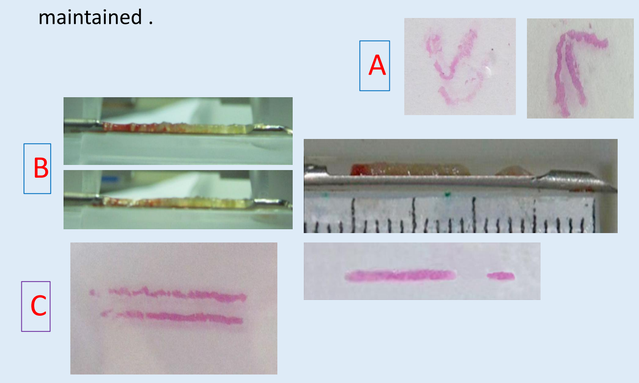
[B] 3D model of the prostate with core localization and a within core cancer indication.

Materials & methods

The SBx™ biopsy download system captures the biopsy core configuration (as on the needle), and polarity, [Fig. 3 B/C] and therefore allows a precise within-core cancer localization. The Navigo™ system allows for a post procedure core log pathology update so that both a 3D within-prostate and within–core cancer localization is registered. Biopsy/histology data was gathered in procedures using SBx™ and Navigo™ and analyzed for multiple variables (core/fragments/cancer lengths and locations) in cancer baring cores. Thereafter we estimated by encircling cancer within a single or more cores the hypothetical (H , i.e. for a standard 3D biopsy) Vs. SBx™ data based (SBx + Navigo) "real-life" tumor volume (Tvol).

Figure 3:

A. Standard biopsy - when cores are dropped into the formalin vial – fragmentation, stacking, loss of orientation, etc. is expected.
B. Biopsy cores on the needle prior to the SBx download
C. Same cores after SBx download and processing , as seen on the glass slide – the exact configuration, and orientation as on the needle is clearly maintained .

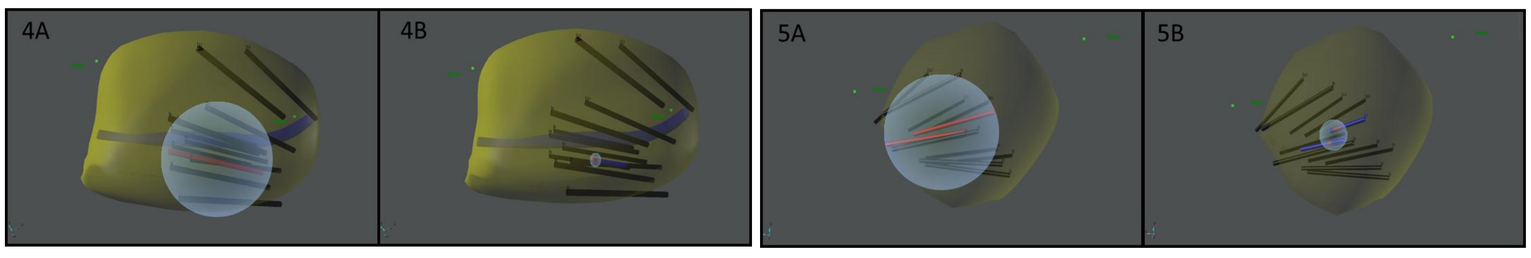


Results

We analyzed 160 cancer baring cores. Average cancer length (diameter) was : SBx™ - 0.445±0.35cm Vs. the assumed hypothetical(H) - 2 cm, which is a standard core length. This equals a Tvol of 0.15±0.3cc (for SBx™) Vs. 4.19 cc (for H),- and translates to a X 27.9 relative reduction of the tumor/target volume [Fig. 4-A/B].
Tvol of single cores foci was calculated to be <0.2 ml in 80.6%, 0.2><0.5ml in 8.1%, and >0.5 ml in 11.3%, - of the cores examined. Modulations for a treatment volume of 2 (or more) adjacent cancer baring cores yielded clearly a higher Tvol then for a single positive core, but still a significantly smaller volume for the SBx based planning than for a those of a regular biopsy [Fig. 5-A/B]. In 35% of the cores the tumor was located at the core edge. By examining the tumor location within-core and within-prostate estimated proximity to prostate structures were possible,- In 25%, 60% & 8% of cases the lesions where localized close to urethra, the Neuro-vascular-bundle or the apical urethra, correspondingly.

Figure 4/5: (Simulation for a single [4] or couple [5] of positive core)

A. The entire 2 cm of core length of a hypothetical/standard positive encircled for assumed cancer
B. Only the true cancer baring segment/s encircled (SBx)



Conclusion

We hereby show that even the best within-gland accuracy achieved by any 3D-IGB is still considerably inaccurate due to the given 2cm ambiguity of the tumor location along the core in any standard biopsy download.
The combination of within-core and within-gland cancer localization data seems mandatory for accurate prostate cancer management. These two localizations need to complement each other to yield an accurate spatial cancer whereabouts. This allows a refine cancer burden assessment, a more accurate planning of repeated guided biopsies (i.e. in active surveillance), or the execution of treatments ,- specifically precision (“truly”) focal therapy.