Eight Year Interim Results of a 20-Year Observational Study of Transrectally Delivered, MRI-Guided Laser Interstitial Thermal Therapy of Prostate Cancer in an Outpatient Setting

Prepared for Brigham and Women’s, May 8, 2018
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Clinical Instructor, UC Riverside School of Medicine,
Department of Internal Medicine
Chief Research Officer, Desert Medical Imaging
Disclosures:

Ms. Greenwood has nothing to disclose
Genomic Classifiers
and their Possible Role in Focal Therapy

Topics to be discussed:

The history of biopsy strategies
Evolution of mpMRI
Technical aspects of MRI-guided biopsies
Rationale for MRI-guided laser focal therapy of PCa
Update on NCT #02243033 (Phase II clinical trial)
PROSTATE CANCER AWARENESS DAY

throughout the State of Wisconsin, and I commend this observance to all of our citizens.

IN TESTIMONY WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Wisconsin to be affixed.
Done at the Capitol in the City of Madison
8th Day of June 2015.

SCOTT WALKER
GOVERNOR

By the Governor:

Douglas A. Follette
Secretary of State
BREAST MRI

• Complements Mammo / US
• Breast intervention (do a targeted biopsy under MR) per ACR practice guidelines
• Mastectomy vs. lumpectomy and focal treatment

PROSTATE MRI

• Complements PSA / DRE / TRUS
• Prostate intervention (targeted biopsy under MR-guidance)
• MR/US fusion biopsy
• Focal therapy vs. whole-gland, radical treatment (prostatectomy, XRT, ADT)
**Literature Timeline 1920 - present**

<table>
<thead>
<tr>
<th>1920's</th>
<th>1922 – Barringer: Transperineal needle biopsy</th>
<th>1926 – Young: Open perineal biopsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930's</td>
<td>1930 – Ferguson: First perineal needle aspiration biopsy</td>
<td>1937 – Astraldi: First transrectal biopsy</td>
</tr>
<tr>
<td>1940's</td>
<td>-----</td>
<td>-----</td>
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<tr>
<td>1950's</td>
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<tr>
<td>1970's</td>
<td>1968 – McNeal: proposes three distinct glandular zones</td>
<td></td>
</tr>
<tr>
<td>1990's</td>
<td>1995 – Stamey: modified sextant technique to include laterally directed nerve blockade used for biopsy pain management</td>
<td>1996 – Nash et al.: peri-prostatic nerve blockade used for biopsy pain management</td>
</tr>
<tr>
<td>2000's</td>
<td>2004 – Beyersdorff et al.: MRI-guided prostate biopsy at 1.5T</td>
<td></td>
</tr>
<tr>
<td>2012 – NCCN Guidelines include Multiparametric MRI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Applewhite, Cancer Control 141, March/April 2001, Vol. 8 No.2

Prostate Biopsy in the 1920’s

Prostate Biopsy in the 1930‘s

Prostate Biopsy in the 1960’s

1963 – Takahashi and Ouichi: TRUS to evaluate prostate

1968 – Watanabe et al.: First clinically useful TRUS images

1968 – McNeal: proposes three distinct glandular zones

Prostate Biopsy in the 1980’s

1980’s  Mid-1980’s – improvements in transducer technology and biopsy capability

1986 – PSA test introduced for prostate cancer screening

1989 – Hodge et al.: modern era of systematic prostate biopsy begins

Prostate Biopsy in the 1990’s

- 1995 – Stamey: modified sextant technique to include laterally directed biopsy
- 1996 – Nash et al.: peri-prostatic nerve blockade used for biopsy pain management
- 1997 – Eskew et al.: systematic extended biopsy technique
Figure 2 Prostate as seen on transrectal ultrasonography during saturation biopsy


Andriole GL (2009) The lottery of conventional prostate biopsy
Nat Rev Urol doi:10.1038/nrurol.2009.46
Saturation Biopsy

Photography courtesy of Thomas Polascik. M.D., Duke University
Saturation Biopsy
Saturation Biopsy
Saturation Biopsy
"Good news! The exploratory surgery turned up negative!"
Prostate Biopsy in the 2000’s

Ultrasound vs. MRI

Figure 7: Ultrasound scan of the prostate gland
National Guidelines - 2009

**Prostate Cancer**

**Initial Management or Pathology**

- Life expectancy ≥ 10 y
- Active surveillance

**Surveillance**

- PSA as often as every 3 mo but at least every 6 mo
- DRE as often as every 6 mo but at least every 12 mo
- Repeat prostate biopsy as often as annually

**Recurrence**

- PSA, DRE, prostate biopsy may be done less frequently
Prostate Intervention in the 2010’s

2010’s
2011 – Greenwood et al.: Transrectal MRI-guided laser interstitial thermal therapy of PCa
2011 – Pinto et al.: MRI/US fusion prostate biopsy
2012 – NCCN Guidelines include Multiparametric MRI

Prostate Cancer Early Detection

Repeat Biopsy Technique
Patients with prior negative biopsies, yet persistently rising PSA values should undergo repeat biopsy. Important factors in predicting chance of cancer on repeat biopsy include PSAV and the adequacy of initial biopsy (number of cores, prostate size). Cancer detection rates are higher in men with prior negative sextant biopsies compared to those with prior negative extended biopsies. Yields are highest in the laterally directed cores and the apical cores. Particular attention should be given to apical sampling including the anterior apical horn, which is comprised of peripheral zone. Transition zone biopsies can be considered in repeat biopsy patients. In patients with two negative extended biopsies, yet persistently rising PSA values, a saturation biopsy may be considered. Recent evidence showed that multiparametric MRI (T2 weighting plus functional techniques such as diffusion weighting) can aid in cancer detection in patients with persistent PSA elevation but negative TRUS-guided biopsy (reviewed by Pinto et al.). Additional MRI imaging can be considered in select cases.
ESUR prostate MR guidelines 2012

Jelle O. Barentsz • Jonathan Richenberg •
Richard Clements • Peter Choyke • Sadhna Verma •
Geert Villeirs • Olivier Rouviere • Vibeke Logager •
Jurgen J. Fütterer
PI-RADS v2

**PI-RADS v2 Classification**

<table>
<thead>
<tr>
<th>PI-RADS</th>
<th>Description</th>
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<tbody>
<tr>
<td>5</td>
<td>Highly Suspicious for Malignancy</td>
</tr>
<tr>
<td>4</td>
<td>Probably Malignant</td>
</tr>
<tr>
<td>3</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>2</td>
<td>Probably Benign</td>
</tr>
<tr>
<td>1</td>
<td>Most Probably Benign</td>
</tr>
</tbody>
</table>

*Based Upon ACR Guidelines January 2015.*

PI-RADS v2
PI-RADS v2
Multiparametric MRI

ACR Appropriateness Criteria®
ACR PI-RADS V2, published 2014

https://acsearch.acr.org/docs/69371/Narrative/
INDICATIONS FOR BIOPSY

PSA >3.0 ng/mL\textsuperscript{f} \hspace{1cm} • Repeat PSA
• DRE
• Workup for benign disease

\hspace{1cm} \rightarrow \hspace{1cm} TRUS-guided biopsy\textsuperscript{g} \hspace{1cm} See Management of Biopsy Results (PROSD-4)

or

Follow up in 6–12 mo with PSA/DRE\textsuperscript{h}

or

Percent free PSA, 4Kscore, or PHI\textsuperscript{h}

---

TRUS-GUIDED BIOPSY
Initial and Repeat
Extended-pattern biopsy (12 cores)
• Number of cores:
  • Sextant (6),
  • Lateral peripheral zone (6), and
  • Lesion-directed at palpable nodule or suspicious image
• Anteriorly directed biopsy is not supported in routine biopsy. However, the addition of a transition zone biopsy to an extended biopsy protocol may be considered in a repeat biopsy if PSA is persistently elevated.
• Multiparametric MRI followed by lesion targeting may maximize the detection of higher risk disease and limit the detection of lower risk disease.\textsuperscript{f}
• Local anesthesia can decrease pain/discomfort associated with prostate biopsy and should be offered to all patients.

Prostate Cancer Localization with Dynamic Contrast-enhanced MR Imaging and Proton MR Spectroscopic Imaging

Jurgen J. Fütterer, MD, PhD, Stijn W. T. P. J. Heijmink, MD, Tom W. J. Scheenen, PhD, Jeroen Veltman, MD, Henkjan J. Huisman, PhD, Pieter Vos, MSc, Christina A. Hulsbergen–Van de Kaa, MD, PhD, J. Alfred Witjes, MD, PhD, Paul F. M. Krabbe, PhD, Arend Heerschap, PhD, and Jelle O. Barentsz, MD, PhD

Accuracy

<table>
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<th>Technique</th>
<th>Accuracy</th>
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<tr>
<td>T2</td>
<td>70%</td>
</tr>
<tr>
<td>DWI</td>
<td>86%</td>
</tr>
<tr>
<td>DCE</td>
<td>85%</td>
</tr>
<tr>
<td>MRS</td>
<td>81%</td>
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ROC AUC = 0.91

Radiology 2006;241:449-458
<table>
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<tr>
<th></th>
<th>NPV</th>
<th>NPV - clinically significant CaP</th>
<th>True negative</th>
<th>False negative (3+3)</th>
<th>False negative (G≥7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (n=53)</td>
<td>64.2%</td>
<td>96.2%</td>
<td>34</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Biopsy naive (n=18)</td>
<td>61.1%</td>
<td>94.4%</td>
<td>11</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Prior negative (n=19)</td>
<td>84.2%</td>
<td>100%</td>
<td>16</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Active surveillance</td>
<td>43.8%</td>
<td>93.8%</td>
<td>7</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

*J Clin Oncol 34, 2016 (suppl 2S; abstr 91)*
Relationship between Apparent Diffusion Coefficients at 3.0-T MR Imaging and Gleason Grade in Peripheral Zone Prostate Cancer

Purpose: To retrospectively determine the relationship between apparent diffusion coefficients (ADCs) obtained with 3.0-T diffusion-weighted (DW) magnetic resonance (MR) imaging and Gleason grades in peripheral zone prostate cancer.

Materials and Methods: The requirement to obtain institutional review board approval was waived. Fifty-one patients with prostate cancer underwent MR imaging before prostatectomy, including DW MR imaging with b values of 0, 50, 500, and 900 sec/mm². In prostatectomy specimens, separate slice-by-slice determinations of Gleason grade groups were performed according to primary, secondary, and tertiary Gleason grades. In addition, tumors were classified into qualitative grade groups (low-, intermediate-, or high-grade tumors). ADC maps were aligned to step-sections and regions of interest annotated for each tumor slice. The median ADC of tumors was related to qualitative grade groups with linear mixed-model regression analysis. The accuracy of the median ADC in the most aggressive tumor component in the differentiation of low- from combined intermediate- and high-grade tumors was summarized by using the area under the receiver operating characteristic (ROC) curve (A).

Results: In 21 prostatectomy specimens, 62 different tumors and 251 step-section tumor lesions were identified. The median ADC in the tumors showed a negative relationship with Gleason grade group, and differences among the three qualitative grade groups were statistically significant (P < .001). Overall, with an increase of one qualitative grade group, the median ADC (±standard deviation) decreased 0.18 ± 10⁻³ mm²/sec ± 0.02. Low-, intermediate-, and high-grade tumors had a median ADC of 1.30 ± 10⁻³ mm²/sec ± 0.30, 1.07 ± 10⁻³ mm²/sec ± 0.30, and 0.94 ± 10⁻³ mm²/sec ± 0.30, respectively. ROC analysis showed a discriminatory performance of A = 0.90 in discerning low-grade from combined intermediate- and high-grade lesions.

Conclusion: ADCs at 3.0 T showed an inverse relationship to Gleason grades in peripheral zone prostate cancer. A high discriminatory performance was achieved in the differentiation of low-, intermediate-, and high-grade cancer.
TRUS biopsy

Needle penetrates next to the tumor or does not reach it

Less aggressive tumor is biopsied

Less aggressive part of the tumor is biopsied

The patient can end up on active surveillance while harboring clinically significant disease

Courtesy Jelle Barentsz, M.D., PhD, Univ. Medical Center, Nijmegen, The Netherlands
TRUS-Biopsy & MR-Biopsy vs. Prostatectomy

Hambrock 2010  SCBTMR “Lauterbur Award”
Trans-rectal interventional MRI: initial prostate biopsy experience

Bernadette M. Greenwood, Meliha R. Behluli, John F. Feller, Stuart T. May, Robert Princenthal, Axel Winkel, David B. Kaminsky

Invivo Corporation, N27 W23676 Paul Rd., Pewaukee, WI USA 53072
Desert Medical Imaging, 74-785 Hwy 111, Indian Wells, CA 92210
Thousand Oaks, CA 91361
N. Palm Canyon Dr., Palm Desert, CA 92261
19061 Schwerin, Germany

In-bore magnetic resonance-guided transrectal biopsy for the detection of clinically significant prostate cancer

Ely R. Feller, Stephanie A. Lee-Feller, John Feller, Daniel J. Margolis, David S. Lu, Robert Princenthal, Stuart May, Martin Cohen, Jiaot Huang, Jeffrey Yoshida, Bernadette Greenwood, Hyun J. Kim, Steven S. Berman

Department of Radiology, Ronald Reagan UCLA Medical Center, University of California, Los Angeles, CA 90024, USA
Department of Pathology, David Geffen School of Medicine at UCLA, Los Angeles, CA 90024, USA
Department of Pathology, UCLA School of Medicine, Los Angeles, CA 90095, USA
Department of Radiology, Desert Medical Imaging, Indian Wells, California
Department of Radiation Oncology, New York University School of Medicine, New York, New York

MRI-Guided Prostate Biopsy of Native and Recurrent Prostate Cancer

David A. Woodrum, MD, PhD
Krzysztof R. Gorny, PhD
Bernadette Greenwood, BSc, BSRS, RT(R)(MR)
Lance A. Myndesse, MD

Department of Radiology, Mayo Clinic, Rochester, Minnesota
Desert Medical Imaging, Indian Wells, California
Department of Urology, Mayo Clinic, Rochester, Minnesota
Address for correspondence: David A. Woodrum, MD, PhD, Department of Radiology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905 (e-mail: woodrum.david@mayo.edu)
Rationale for Prostate MRI

• Ability to biopsy tumor suspicious regions in the prostate

• MRI guidance for biopsy planning to target tumor-suspicious regions (TSRs)
Transrectal Interventional Planning

Instrument: 18G 150 mm with spacer

Device Settings:
- U/R Rotation: 13° Clockwise
- A/P Angulation: 45°
- I/F Movement: 6 mm

Target Location: L 11.0, P 20.6, H 64.0

Unlock target.
Why MRI for the Prostate Today?

- Easy access to patient for biopsy

1.5T Philips Achieva XR
Why MRI for the Prostate Today?

- Easy access to patient for biopsy

Gleason 4 + 3 = 7
PROSTATE, NEEDLE BIOPSIES:

(A1) Right Peripheal zone Base level: ADENOCARCINOMA (GLEASON SCORE 4 + 4 = 8) INVOLVING 35% OF THE SPECIMEN (2 OF 3 CORES CONTAIN CANCER). CANCER LENGTH 1.3 cm. PERINEURAL INVASION.

<table>
<thead>
<tr>
<th>Site</th>
<th>Diagnosis</th>
<th>Core Length</th>
<th>Cancer Length</th>
<th>%Involvement</th>
<th>Gleason Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A1)</td>
<td>Malignant</td>
<td>1.5,1.3,0.9</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>(A1)</td>
<td>Malignant</td>
<td>1.5,1.3,0.9</td>
<td>1.30</td>
<td>35</td>
<td>4 + 4 = 8</td>
</tr>
</tbody>
</table>

For a given targeted biopsy location, cores may be combined into one vial. In these instances, the cancer length and percentage of involvement calculations are based on all cores received in the vial for that targeted biopsy location.
What is it? Why does it matter?

Gleason Grades Determine Gleason Score

What is it? Why does it matter?

Gleason Grades Determine Gleason Score
Phase II Laser Focal Therapy of Prostate Cancer (LITT or FLA)

This study is currently recruiting participants. (see Contacts and Locations)

Verified May 2016 by Desert Medical Imaging

Sponsor:
Desert Medical Imaging

Information provided by (Responsible Party):
Desert Medical Imaging

ClinicalTrials.gov Identifier:
NCT02243033

First received: September 9, 2014
Last updated: May 28, 2016
Last verified: May 2016
History of Changes
MR-guided Laser Focal Therapy

1. Water-cooled disposable laser probe
   - 980 nm diode laser
   - 1.65 mm in diameter

2. Endorectal needle guide

3. 14 G titanium coax needle

Heat-diffusing tip
Laser Workstation

- 15 Watt laser *(Fiberoptic)*
- Standard power plug
- Integrated to MR (Ethernet)
- Software: real-time prediction model; MR thermometry; safety control features
- FDA 510(k) clearance Sept 10, 2008

*The catheter and fiber are MR compatible up to 1.5T*

FDA cleared with broad, general indications

“for use to necrotize or coagulate soft tissue through interstitial irradiation or thermal therapy. . . in neurosurgery, general surgery, urology. . .” and multiple additional named specialties.

Technology is FDA cleared for commercialization in the US:

- **Laser Applicator**
  - K053087 (March 2006)
- **Laser System**
  - K060304 (March 2006)
- **Workstation Software**
  - K063505 (December 2006)
- **Visualase Thermal Therapy System**
  - K071328 (August 2007)
  - K081656 (September 2008)
- **30 W Laser System**
  - K092197 (November 2009)
Materials and Methods:
TRANBERG cannula retracted in sagittal and axial planes.
Dissection:
The Team:

Alan Weinberg - CLS
Bernadette M. Greenwood, PG Cert., BSc. – DMI
Dr. John F. Feller – DMI
Thomas Noah - CLS
Rationale for 1.5T

• Operator: Credentialed, experienced MRI technologist familiar with mpMRI protocol
• Software: modern, state-of-the-art (ability to perform high b-value diffusion)
• Coil choices: high channel-count surface coils
• Patient preparation: NPO, glucagon, etc.
• Interpreter: Experienced Radiologist

IMV Benchmark Report MR 2013; IMV Medical Information Division, Inc., 2013

U.S. 1.5T Scanners 2013
1.5 Tesla vs. 3 Tesla ERC
1.5 Tesla vs. 3 Tesla
Image Generation and MR Thermometry

MRI Parameter selection allows for exploitation of tissue properties such as:

- Tissue contrast
- Flow quantification
- Perfusion
- Diffusion
- Phase shifts

Parameters include:

- Echo Time
- Repetition Time
- Flip Angle
- Bandwidth
- Signal Averages
- Matrix
MR Thermometry and Image Generation

Gradient recalled echo sequences allow measurement of phase shifts

Damage to tissue can be modeled as an Arrhenius rate process:

\[ \Omega = A \cdot \int_0^t e^{-\frac{E_a}{RT(\tau)}} d\tau \]

\( A = \text{frequency factor } (3.1 \times 10^{98} \text{ s}^{-1}) \)
\( E_a (6.25 \times 10^5 \text{ J/mol}) = \text{activation energy} \)
\( R = \text{universal gas constant} \)
\( T(\tau) = \text{absolute temp. in } \degree\text{K as a function of time} \)
Thermometry interface - Proton resonance frequency (PRF) shift thermometry
Contouring and Safety Controls
Salvage post-prostatectomy April 5, 2018

Bernadette Greenwood @multiparametric · Apr 5
Before and after. Tricky!
Real Time MR Thermometry

Test Dose
4W (27%)
~100 degrees F

Treatment Dose
12W (80%)
90 sec
Irreversible Damage Estimate
Technical aspects of trans-rectally delivered, MRI-guided laser therapy of prostate cancer

Poster No.: C-1045
Congress: ECR 2011
Type: Scientific Paper
Authors: B. M. Greenwood\textsuperscript{1}, J. F. Feller\textsuperscript{2}, R. McNichols\textsuperscript{3}; \textsuperscript{1}Pewaukee, WI/US, \textsuperscript{2}Indian Wells, CA/US, \textsuperscript{3}Houston, TX/US
Keywords: Genital / Reproductive system male, Oncology, Pelvis, MR, CAD, Image manipulation / Reconstruction, Ablation procedures, Laser, Computer Applications-General, Tissue characterisation
DOI: 10.1594/ecr2011/C-1045
Patient J.D.

GS 3+4=7
Patient J.D. – MRG Laser focal therapy 8/2014

Ax T1 +C
Patient J.D. – MRG Laser focal therapy 8/2014

Sag T1 +C
Patient J.D.

Negative bx at 6 mo. f/u focal laser
Laser interstitial thermal therapy margins

**Precision and Control**

Sharp transition zone between dead and viable tissue

Transition zone in HIFU can be 5-10 mm

Transition zone in RF and Cryo can be 5-10 mm

Visualase transition zone is less than 1 mm

US-guided HIFU lesion

Necrotized tissue

Source
http://jcp.bmjjournals.com/content/53/5/391/F1.expansion

* Photos at different scales
Methodology

- IRB approved, 510k cleared technology
- NCT# 02243033
- Outpatient trans-rectal laser therapy (15W, 980 nm diode laser) guided with 1.5T MRI system (image acquisition & real-time thermometry)
- True focal therapy
- Goal to eliminate MRI abnormality + 1 cm
- 175 cancer foci treated in 119 patients from 2010 – 2018
- 6-Month biopsies performed with MRI active surveillance follow-up
- Evaluation of PSA, PSAD, mpMRI, recurrence rates (marginal, incidence), IPSS, SHIM, PHQ-9

Patient Population At A Glance:

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Data</th>
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<tbody>
<tr>
<td># of Patients</td>
<td>119</td>
</tr>
<tr>
<td># of Treatment Naïve Patients</td>
<td>100 / 119 (84%)</td>
</tr>
<tr>
<td># of Salvage Patients</td>
<td>19 / 119 (16%)</td>
</tr>
<tr>
<td># of Total Lesions</td>
<td>175</td>
</tr>
<tr>
<td># of Treatment Naïve Lesions</td>
<td>150 / 175 (86%)</td>
</tr>
<tr>
<td># of Salvage Lesions</td>
<td>25 / 175 (14%)</td>
</tr>
<tr>
<td>Mean Initial PSA</td>
<td>7.31</td>
</tr>
<tr>
<td>Mean Nadir PSA</td>
<td>3.19 (56% drop)</td>
</tr>
<tr>
<td>Min Age</td>
<td>48</td>
</tr>
<tr>
<td>Max Age</td>
<td>87</td>
</tr>
<tr>
<td>Median Age</td>
<td>67</td>
</tr>
</tbody>
</table>
Tumor Location Statistics

All Patients:

- **TZ, 51, 29%**
- **PZ, 111, 63%**
- **CZ, 8, 5%**
- **BL, 3, 2%**
- **SV, 2, 1%**

Treatment Naïve:

- **TZ, 41, 27%**
- **PZ, 102, 69%**
- **CZ, 4, 9%**
- **SV, 2, 1%**
- **BL, 2, 1%**
- **(pending)**

Salvage:

- **TZ, 10, 62%**
- **PZ, 9, 5%**
- **CZ, 0, 0%**
- **SV, 2, 4%**
- **BL, 2, 4%**
- **(pending)**
Gleason Score Breakdown – All Patients

- 3+3=6, 46, 26%
- 4+3=7, 41, 24%
- 4+4=8, 2, 1%
- 5+5=10, 1, 1%
- 3+4=7, 79, 45%
- 4+5=9, 4, 2%
- (pending)
Gleason Score Breakdown – Treatment Naïve

- 3+4=7, 76, 51%
- 4+3=7, 30, 20%
- 3+3=6, 43, 29%

Legend:
- 3+3=6
- 3+4=7
- 4+3=7
- 4+4=8
- 4+5=9
- 5+4=9
- 5+5=10
- (pending)
Gleason Score Breakdown – Salvage

- 4+3=7, 11, 44%
- 4+4=8, 2, 8%
- 4+5=9
- 5+4=9
- (pending), 1, 4%
- 3+3=6, 3, 12%
- 3+4=7, 3, 12%
- 5+5=10

Gleason Score Breakdown for Salvage patients.
Results – Biopsy Proven Recurrence Statistics

• While no prostate cancer-specific deaths have occurred, a Kaplan-Meier Curve of recurrent cancer is shown with 95% confidence interval bands.

• The drop at the 6-month mark is due to the protocol with a biopsy being acquired 6-month following treatment to detect marginal recurrence.

*Excludes $3+3=6$ recurrence
Results – Kaplan-Meier Survival Curves

- At 7 years:
  - Only 1 case of metastasis
  - Metastasis-free survival 99%

- At 7 years:
  - No prostate cancer-specific deaths
  - Cancer-specific survival 100%
  - Overall survival 98%
Results – Biopsies (with significance breakdown)

- Biopsies evaluating treatment efficacy performed at 6 months.

- MRI active surveillance over 8 years.

(“Clinically Significant” excludes 3+3=6)
Field Cancerization: “WHAC-A-MOLE” Patients
Results – PSA

• Mean PSA dropped 38%, 12 months following treatment

• 95% Confidence Interval shown as error bars

• Compared to the initial PSA (Month 0), paired Student’s t-test used to evaluate mean PSA, $p<.001^{***}$
Conclusions & Next Steps

• 8 year interim data in over 100 patients indicates outpatient MR-guided trans-rectal laser focal therapy is both safe and feasible.

• No statistically significant erectile dysfunction, or incontinence.

• Favorable results for quality of life without eliminating the possibility of whole-gland therapy or additional laser focal therapy in patient’s future.

• Short term and intermediate term oncologic control is achievable in 75% of patients.

• Minimally-invasive outpatient laser focal therapy of prostate cancer may be an attractive option for specific patient populations.

• “Nothing ruins good results like follow-up.” >>> 20 year Phase 2 study ongoing.

• International multi-institutional Phase 2 trial through the International Laser Network awaiting IRB approval.

• Ongoing IRB approved clinical trial exploring tissue genomics for risk stratification.

• IND submission completed to FDA for combination therapy awaiting approval.
References


Bernadette M. Greenwood, BSc. (760)766-2047
s1476597@ed.ac.uk or bernadette.greenwood@desertmedicalimaging.com
Disclosures:
Ms. Greenwood has no financial disclosures

Clinical Instructor, Department of Internal Medicine
UC Riverside School of Medicine

Co-Founder, Vice-President International Laser Network

Our goal is to create an open forum for the purpose of sharing experience. Each investigator brings a wealth of unique experiences we can leverage to keep patients safe, optimize techniques and improve patient outcomes.
Acknowledgements

- John Feller, MD (DMI)
- Stuart May, MD (DMI)
- Roger McNichols, PhD (Visualase Inc.)
- Axel Winkel (Invivo-Germany)
- Wes Jones, (DMI)
- Rob Toth, PhD (Biostatistician Toth Technology, Virbio)

- Andrew Farrall, BSc, MSc, MD, FRCPC (Diagnostic Radiology, Univ. Edinburgh)
- Elda Railey, Co-founder Focus on Research (Research Advocacy Network)
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Thank you for your attention!

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