New Directions in Interventional Oncology

MAXIO is US FDA -510K approved & CE marked

Perfint™
- **Company; Founded in 2008**
  - Headquartered in Chennai, India; R&D and manufacturing also based in Chennai
  - Advanced R&D subsidiary in Redmond, USA;
  - Go-to-market teams in APAC, China and the EU

- **Universally regarded as the thought leader in IO solutions**
  - Products installed at some of the world’s top hospitals and universities
  - Approved in key geographies: China, US, India, EU and Japan (CY’15)

- **Founders represent 100+ years of combined experience in medical technology**

**Perfint receives Product Innovation award 2009 for PIGA CT from Frost & Sullivan...**

**Perfint Healthcare Selected as a 2010 Red Herring Asia Top 100 Tech Startup**

& MANY MORE...
2009
First generation Robotic targeting system

2011
2nd generation Robotic targeting system for CT guided interventions

2012/13
Advanced Planning and Robotic Targeting system for CT guided ablation

NAVIGATION FOR IO

ROBotics for IO

MAXimum capabilities and versatility in IO

FDA Clearance - May 2014
<table>
<thead>
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<th>Country</th>
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</tbody>
</table>
Diagnostic Indications
Biopsy
FNAC
Drainage

Therapeutic Indications
Ablation - RF, MW, Cryo, IRE PEI
Pain management

Therapeutic Indications
Radioiodine Placement

VALUE OF
OUR SYSTEMS
CLINICAL INDICATIONS ABLATION

MAXIO

LIVER
- Curative
- Combination Therapy
- Bridge - Transplant
- Palliative

LUNG
- Primary
- Metastatic

Ablation

KIDNEY
- Osteoid Osteoma
- Soft tissue mass
- Bone mets

BONE
- Osteoid Osteoma
- Soft tissue mass
- Bone mets

Adrenal, Thyroid, Prostate, Breast

CONFIDENTIAL
Technical success of probe placement + Clinical success of Ablation

Goal:
To achieve AO ablation

Multiple probe placements
Residual Disease

Rhim H et al. Radiographics
2001;21:S17-S35
RadioGraphics
Figure 3 The most important lessons learned from 3000 radiofrequency ablation (RFA) procedures. The most important keys for successful ablation are best planning, safe ablation and complete ablation. Many technical advances are ongoing to enhance these basic factors in the field of interventional oncology such as: refinement of radiofrequency devices; technical tips for safe ablation; fusion imaging for accurate targeting, better monitoring and precise assessment of the treatment response; and combined treatment with new chemotherapeutic agents. RCT, randomized clinical trial.
CT- Guided Robotic Assisted Thermal Ablation

MAXIO System
Ablation planning, positioning and verification

Energy device
<table>
<thead>
<tr>
<th>See Tumor</th>
<th>Plan Procedure</th>
<th>Treat Tumor</th>
<th>Verify Ablation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unassisted</td>
<td>Assisted</td>
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</table>

**Unassisted**
- 2D Visualization
- No contrast info
- One Series a time

**Assisted**
- Image Registration, Segmentation, 3D visualization
- No-Go definition, multi-needle, Multi-tumor plan, ablation sim
- Robotic Targeting, Intra-Op verification and replan
- Post operative Visualization

**Multi-needle, multiorgan, Multi/large tumor - challenging**

'Wait' to see outcome
Manual report preparation
Clinical Benefits

- Visualization structures in MPR views
- Segmentation:
  - Tumor
  - One or multiple
  - Vasculature
  - To check thermal injury
  - To decide heat sink

TOOLS PROVIDED:
- CT-CT registration
- Single click liver segmentation
- Semiautomatic tumour segmentation
- Editing tools
- Volume measurement
**Clinical Benefits**

- Select technology and probes
- Skin entry point
- Depth and target point
- No of probes

**TOOLS PROVIDED:**
- Parallel probe placement
- Non parallel probe placement
- Ablation volume display
- Upto 6 probes planning
- Probe editing
- Collision in case of multiprobe
- Trajectory details (Depth, angulations)
- NoGO warning
- Planning in any MPR view and 3D view
**Clinical Benefits**

- Plan report created
- Plan transferred to Robotic positioner
- Clinicians advanced needle through EE
- Check scan images

**TOOLS:**
- Connectivity indications
- Sequencing algorithm
- CT-CT registration for check scan
- Plan Edit
- Port plan
- Report
Follow up (12 weeks)

- Complete ablation in CEUS, MRI and CT
- No peri- or postinterventional complications

**Clinical Benefits**

- Post ablation volume segmentation
- Registration with pre-ablation volume

**TOOLS:**
- Registration
- Report
- Save reports and plans
- Offline planning support
- Multimodality fusion
- PETCT support
CURRENT INSTALLED BASE

MAXIO™

Nearly 100 Installations Worldwide

4000+ IO PROCEDURES ASSISTED WITH PERFINT PRODUCTS

☑️ China, N. Africa, US - revenue planned in FY2015
☑️ Japan in 2015 with SONIO
☑️ Exploring Nigeria

China, N. Africa, US - revenue planned in FY2015
Japan in 2015 with SONIO
Exploring Nigeria
CLINICAL ADVISORY TEAM/KEY OPINION LEADERS

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Vice Chair and Chief of
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University of Toronto

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Regensburg, Germany

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University, Seoul, Korea

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(UMMC), Kuala Lumpur, Malaysia

Dr. Vikram Patel
Director, Phoenix Interventional
Center for Advanced Learning
Chicago

Dr. Bhaskar Tandon
Northern Lincolnshire and Goole
Hospitals NHS, Grimsby, UK
Professor Radeleff... “MAXIO is the only commercially available Robotic system for Interventional Radiology that can be used successfully on human beings.”

“I certainly believe it as some of the things I have done with MAXIO I could not have done on my own.” - Australia

“I could use for complicated angular cases” - China

“Patient felt so comfortable to sit, walk and she wont feel any radiating pain on ankle and foot.” - India

**Value of planning : Heidelberg**

Doc wanted to perform an IRE so he started planning 6 needles. Lesion was close to the diaphragm and the trajectory would either cross the colon, or the lung. As the planning was very difficult, Dr. Wiggermann decided to perform a Microwave ablation. He planned one needle (190mm/14G) with 47.35 orbital and 55.91 cranio-caudal angulation”.
Robotic Assisted Thermal Ablation of Liver Tumours
Basri Johan Jeet Abdullah et al, UMMC, Malaysia

- H20 patient (40 lesions) study undergoing RF / MW ablation using MAXIO
- 9 lesions were multiprobe placements
- Thermal ablation was successfully completed in 20 patients with 40 lesions confirmed on multiphasic contrast-enhanced CT with no procedure related complications
- Average number of needle readjustment was 0.8±0.8

To evaluate and compare novel robotic guidance and manual approaches based on procedural accuracy, procedural time, procedural performance, image quality as well as patient dose during image-guided microwave thermoablation
Emmanuel C. Mbalisike, University of Frankfurt

- 70 patients (40 with Manual) (30 Robotic guidance) study undergoing RF / MW ablation using MAXIO.
- Using the novel robotic guided approach improved accuracy of targeting the target tumor, reduce patient dose and increase procedural performance (which influences the procedural safety) are achieved during ablation.
Accuracy and efficacy of percutaneous biopsy and ablation using robotic assistance under computed tomography guidance: a phantom study

Yilun Koethe et al, NIH US

- Mean needle tip-to-target errors were reduced with use of the IR assistance platform (both $P < 0.0001$). Reduced percentage residual tumour was observed with treatment planning ($P = 0.02$).

Robot-assisted radiofrequency ablation of primary and secondary liver tumours: early experience

Basri Johan Jeet Abdullah et al, UMMC, Malaysia

- Radiofrequency ablation of the liver using a robotic-assisted CT guidance system on 11 patients (17 lesions) using ROBIO.
- 5 cases were multiprobe placements with 25° CC angulation in one case.
- Our study showed a significant reduction of CT fluoroscopic dose in patients of 43.9 % (DLP) and 59.2 % (CTDvol) comparing robotic and non-robotic-assisted RFA for HCC.
- Robotic-assisted planning and needle placement appears to have high accuracy, is technically easier than the non-robotic-assisted procedure.
Robot assisted percutaneous placement of K-wires during minimal invasive spinal interventions

Dr. S Zangos et al, University of Frankfurt

- Twenty-four percutaneous K-wires were placed in the pedicles at T2, T7-T12 and L1-L5 in a cadaver specimen
- Mean deviation of 0.5 mm in the z-axis and 1.2 mm in the x-axis between the planned path

Percutaneous CT guided liver biopsy using a robotic assistance device – a corpse study

Dr. Zangos et al, University of Frankfurt

- Total of 32 percutaneous punctures were conducted upon four liver targets
- Standard free hand technique, the deviation of the needle tip from the target lesion was up to 14 mm, while the needle tip deviation with the use of the robotic device was 7 mm utmost
Comparison of Manual and CT-Guided Robotic Positioning System for In-Vivo Needle Placements in Swine Liver
Govind S et al, MSKCC, US

☑ CT-guided RPS assisted needle placement reduced radiation dose, number of confirmatory scans and needle manipulations when compared to manual needle placement by experienced IR physicians, with equivalent accuracy

Preliminary Clinical Experience With a Dedicated Interventional Robotic System for CT-Guided Biopsies of Lung Lesions: A Comparison with the Conventional Manual Technique
Michele Anzidei, MD, Italy

☑ 100 patients randomly assigned for manual (Gr B) and ROBIOEX (GrA)

☑ All biopsies were successfully performed. Procedure duration and radiation dose were significantly reduced in group A as compared to group B (p=0.001)
<table>
<thead>
<tr>
<th>Congress</th>
<th>Product</th>
<th>Title of Presentation</th>
<th>Institution</th>
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<tbody>
<tr>
<td>RSNA 2012</td>
<td>MAXIO</td>
<td>Ablation Assessment: Can we get beyond Contrast enhancement ?</td>
<td>Dr Riccardo Lencioni</td>
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<td>Customizing the ablation strategy with robotic assistance</td>
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<td>ECR 2014</td>
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<td>Early Experience of a Commercial Available Robot (Maxio) for CT-guided Radiofrequency Ablation of liver tumours</td>
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<td>Initial experience of CT-guided percutaneous lung biopsy with assistance of a robotic guiding device</td>
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<td>HK Radiology society, 2014</td>
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<td>Best Practice in Tumour Ablation - Can Robots help to point the way</td>
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<td>IGI, 2014</td>
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<td>Computer Assisted Planning And Image-guided Robotics In CT guided interventional procedures</td>
<td>To be presented</td>
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<td>ISIS 2014</td>
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<td>A Comparative study of Robotic assisted CT GUIDED interventional pain management with conventional Fluroscopy approach</td>
<td>To be presented, Global hospital, India</td>
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<td>Microwave thermoablation of hepatic tumors using a semiautomatic robotic guidance approach</td>
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MAXIO™

REIMBURSEMENT AND ROI
Region Specific Information
THANK YOU