



# IRE for Pancreatic cancer

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# DISCLOSURE

- ▶ Consultant
  - Angiodynamics
  - Boston Scientific
  - Guerbet



# IRE in pancreatic cancer

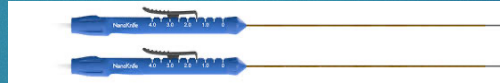
\* off-label use



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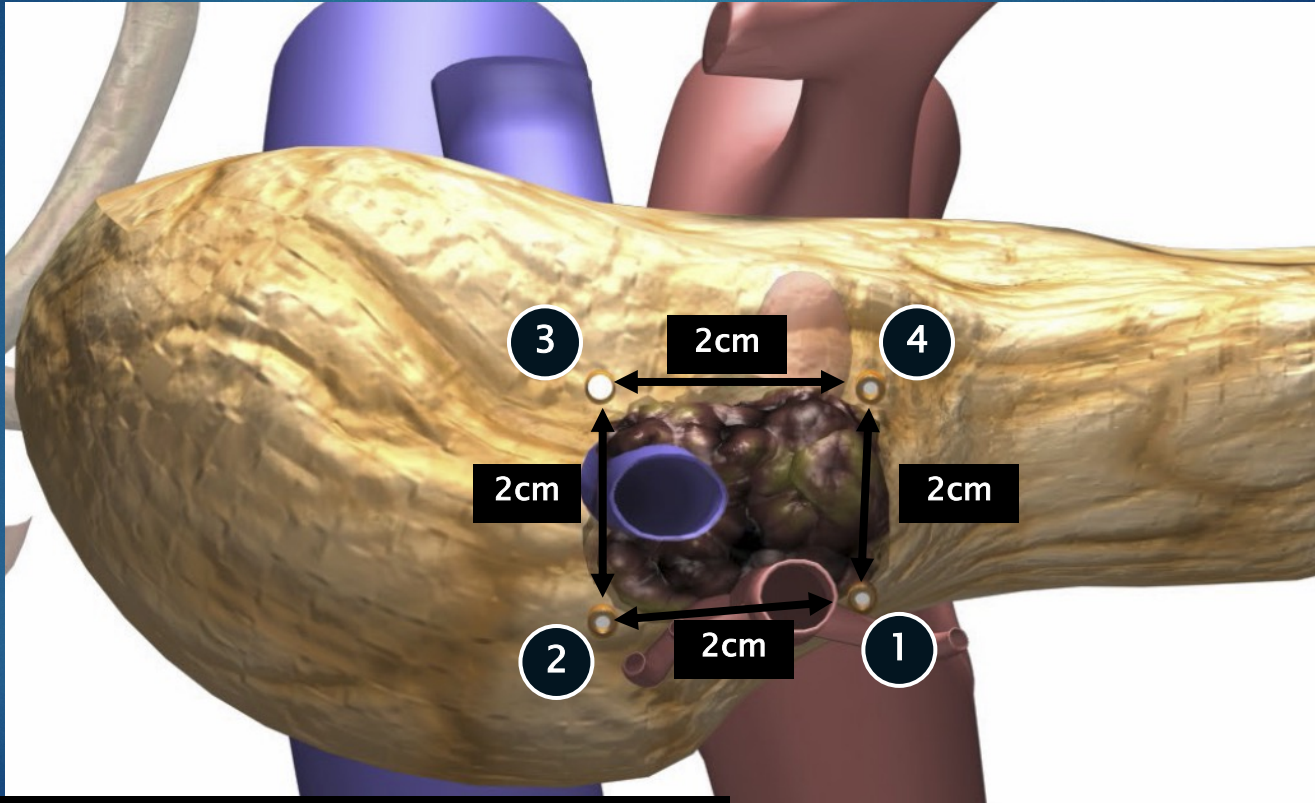
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# IRE DEVICE





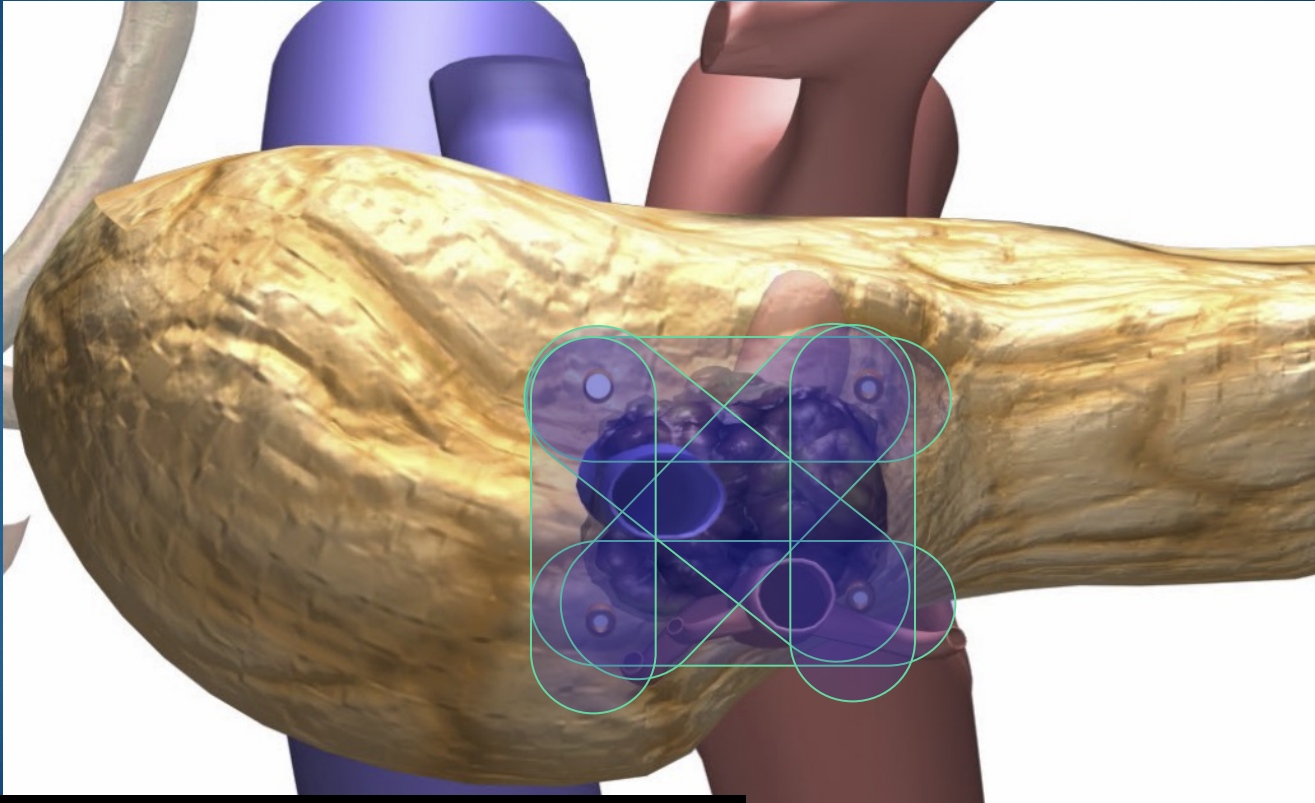
# IRE Probe Spacing – Pancreatic Head



Courtesy : Dr.Robert Martin – J GI Surg

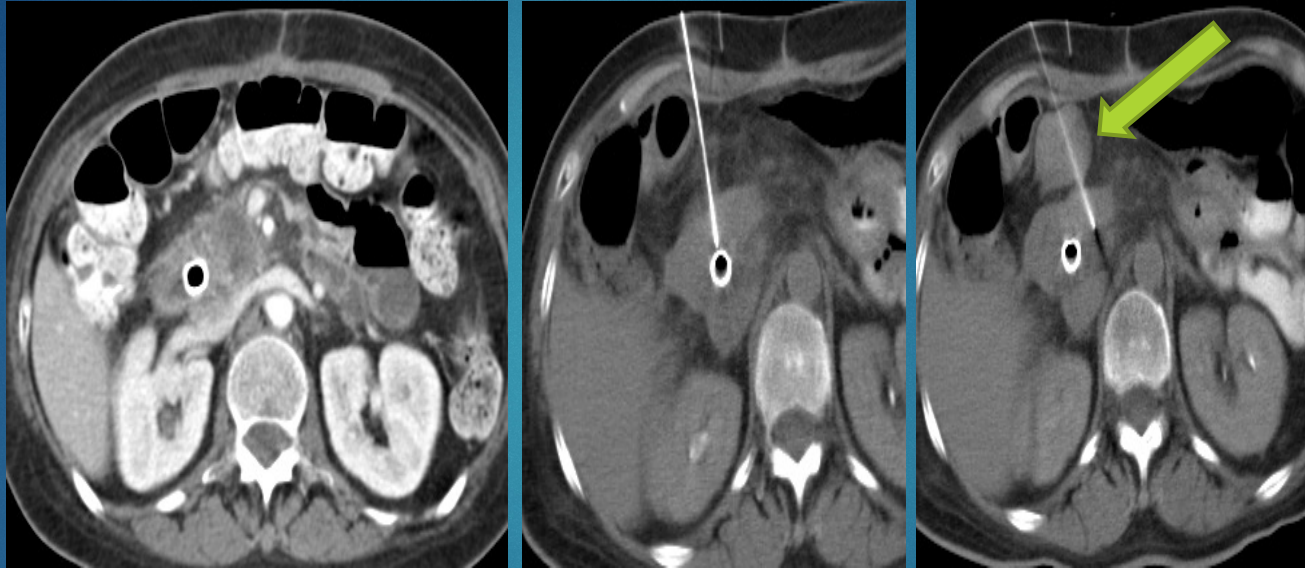
# IRE Energy Delivery – Pancreatic Head

Energy: 3000V, 90us, with 1cm probe exposure





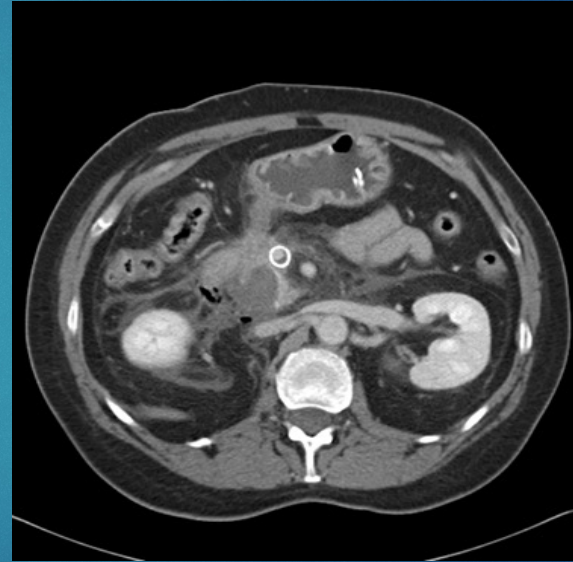
# IRE complications



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# PANCREATITIS





# Percutaneous IRE data



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# Percutaneous IRE for downstaging and control of unresectable pancreatic adenocarcinoma

Govindarajan Narayanan MD, Peter Hosein MD, Geetika Arora MD, Katuska Barbery MD, Tatiana Froud, MD, Alan Livingstone MD, Dido Franceschi MD, Caio M. Rocha Lima MD, Jose Yrizarry MD



2012



# “Percutaneous Image-Guided Irreversible Electroporation for the treatment of Unresectable, Locally Advanced Pancreatic Adenocarcinoma”

*Govindarajan Narayanan, M.D.; Peter J Hosein , M.D.; Isabelle C Beulaygue, Ph.D. ; Tatiana Froud , M.D.; Hester J Scheffer, M.D.; Shree R Venkat, M.D.; Ana M Echenique , M.D.; Elizabeth C Hevert, M.D.; Alan S Livingstone , M.D.; Caio M Rocha-Lima , M.D.; Jaime R Merchan , M.D.; Joseph U Levi , M.D.; Jose M Yrizarry, M.D.; Riccardo Lencioni , M.D.*

# OBJECTIVES

- The primary objective was to assess the **safety profile** of the procedure, the secondary objective to determine **overall survival (OS)**.
- All patients had prior chemotherapy (1-5 lines, median 2) and **30 of 50 (60%)** had prior radiation therapy.
- Follow-up included CT at 1 month and at 3-month intervals thereafter.
- The median time from diagnosis to IRE was **11.6 months**



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# RESULTS

Median OS was 27.0 months (95% confidence interval [CI], 22.7-32.5 months) from the time of diagnosis and 14.2 months (95% CI, 9.7-16.2 months) from the time of IRE

There was no treatment-related deaths and no 30-day mortality



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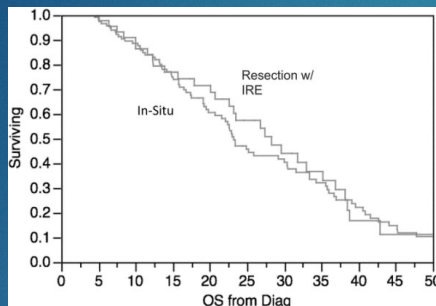
# IDEAL PATIENT FOR PERCUTANEOUS IRE OF PANCREAS

- ▶ Stage 3
- ▶ ECOG 0-1
- ▶ Safe access to reach tumor
- ▶ Has completed atleast one line of chemotherapy
- ▶ Size < 3 cms



# Survival – the US experience

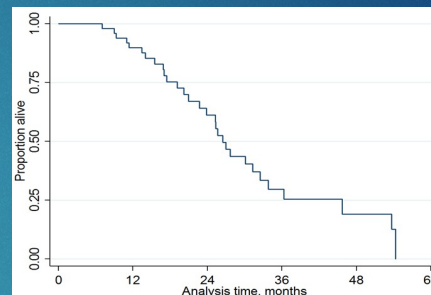
## LOUISVILLE



Open IRE  
OS 24.9 months

Treatment of 200 Locally Advanced (Stage III) Pancreatic Adenocarcinoma Patients With Irreversible Electroporation: Safety and Efficacy. Martin, Robert; II MD, PhD; et al Annals of Surgery. 262(3):486-494, September 2015.

## MIAMI



Percutaneous IRE  
OS 27.0 months

Percutaneous Image-Guided Irreversible Electroporation for the Treatment of Unresectable, Locally Advanced Pancreatic Adenocarcinoma. Govindarajan Narayanan, MD, et al Accepted for publication in JVIR

# Journal of Gastrointestinal Oncology

Percutaneous irreversible  
electroporation with systemic  
treatment for locally advanced  
pancreatic adenocarcinoma

*Edward Leen , John Picard, Justin Stebbing , Mark Abel , Tony  
Dhillon , Harpreet Wasan*

<http://dx.doi.org/10.21037/jgo.2018.01.14>



# Results

- ▶ Post-procedural immediate and 30-day mortality rates were both zero
- ▶ All-grade adverse events were 25%
- ▶ Median in-patient stay was 1 day (range 1–5 days)
- ▶ Median OS and PFS post-IRE for LAPC were 27 and 15 months respectively
- ▶ Four patients with LAPC down-staged post-IRE ablation to be surgically resectable, with R0 resections in 3 cases



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**[ ORIGINAL ARTICLE ]**

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## **Irreversible Electroporation for Nonthermal Tumor Ablation in Patients with Locally Advanced Pancreatic Cancer: Initial Clinical Experience in Japan**

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Katsutoshi Sugimoto<sup>1</sup>, Fuminori Moriyasu<sup>2</sup>, Takayoshi Tsuchiya<sup>1</sup>, Yuichi Nagakawa<sup>3</sup>,  
Yuichi Hosokawa<sup>3</sup>, Kazuhiro Saito<sup>4</sup>, Akihiko Tsuchida<sup>2</sup> and Takao Itoi<sup>1</sup>

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# Results

Median time to local progression after IRE 12 months

Median OS after IRE 17.5 months after IRE

Median OS from diagnosis 24 months

4 major complications in 3 patients

No patient deaths within 90 days post IRE

# Comparison

Study	n	Median OS from IRE Months	Median OS from diagnosis- Months
Meijerink	50	10	17
Narayanan	50	14.2	27
Leen	75	15	27
Sugimoto	8	17.5	24





Submit a Manuscript: <https://www.f6publishing.com>

World J Clin Cases 2020 November 26; 8(22): 5564-5575

DOI: [10.12998/wjcc.v8.i22.5564](https://doi.org/10.12998/wjcc.v8.i22.5564)

ISSN 2307-8960 (online)

ORIGINAL ARTICLE

Clinical Trials Study

## Gemcitabine plus concurrent irreversible electroporation vs gemcitabine alone for locally advanced pancreatic cancer

Yang-Yang Ma, Yin Leng, Yan-Li Xing, Hong-Mei Li, Ji-Bing Chen, Li-Zhi Niu



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He et al. *BMC Cancer* (2019) 19:394  
<https://doi.org/10.1186/s12885-019-5607-3>

BMC Cancer

RESEARCH ARTICLE

Open Access

# Irreversible electroporation versus radiotherapy after induction chemotherapy on survival in patients with locally advanced pancreatic cancer: a propensity score analysis



Chaobin He<sup>1†</sup>, Jun Wang<sup>1,2†</sup>, Shuxin Sun<sup>1†</sup>, Yu Zhang<sup>3</sup>, Xiaojun Lin<sup>1</sup>, Xiangming Lao<sup>1</sup>, Bokang Cui<sup>1</sup> and Shengping Li<sup>1\*</sup>

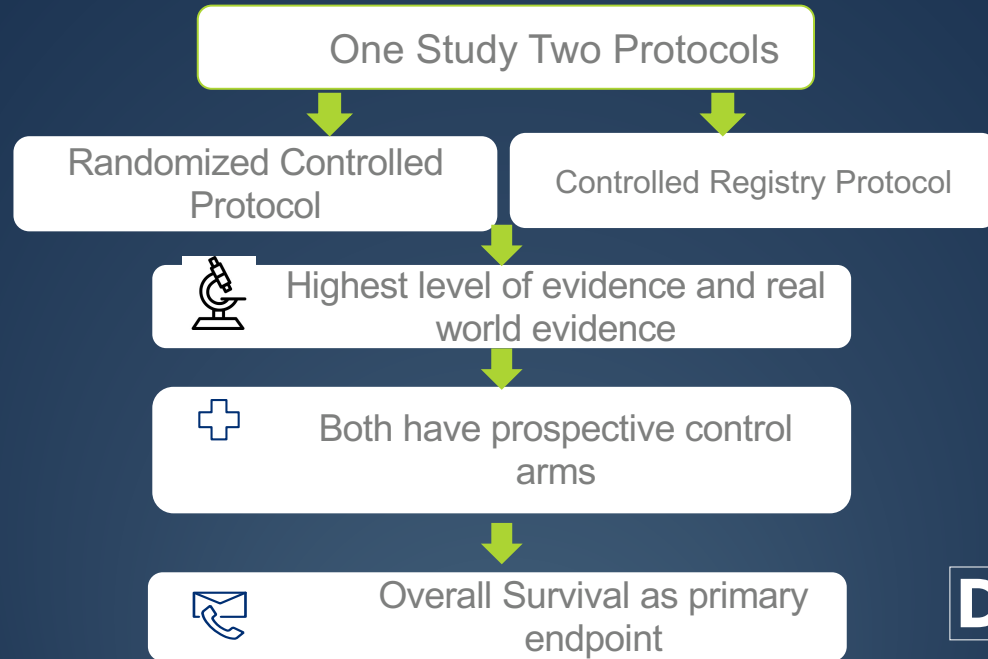


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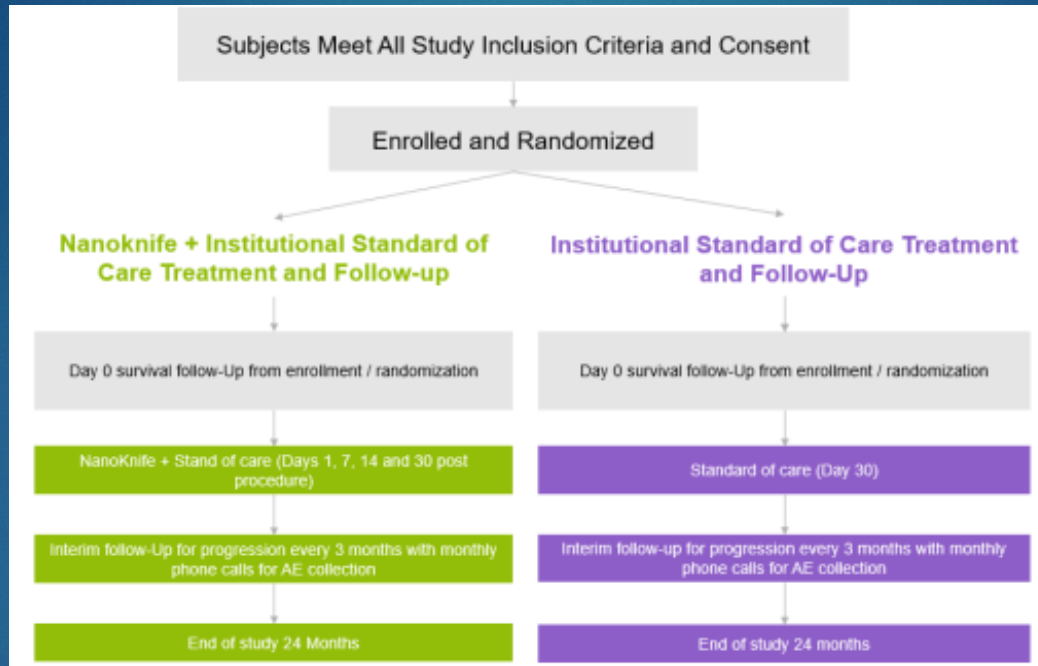
# DIRECT: Data for IRE Cancer Treatment



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# RCT Design





# Future directions



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## Irreversible electroporation reverses resistance to immune checkpoint blockade in pancreatic cancer

• [Jun Zhao<sup>1</sup> <sup>na1</sup>](#), [Xiaofei Wen<sup>1,2,3</sup> <sup>na1</sup>](#), [Li Tian<sup>4</sup>](#), [Tingting Li<sup>1,5</sup>](#),  
[Chunyu Xu<sup>6</sup>](#), [Xiaoxia Wen<sup>1</sup>](#), [Marites P. Melancon<sup>4</sup>](#),  
[Sanjay Gupta<sup>4</sup>](#), [Baozhong Shen<sup>2,3</sup>](#),  
[Weiyi Peng](#) [ORCID: \[orcid.org/0000-0002-7785-6240\]\(https://orcid.org/0000-0002-7785-6240\)](#)<sup>6</sup> &  
[Chun Li](#) [ORCID: \[orcid.org/0000-0002-2376-4703\]\(https://orcid.org/0000-0002-2376-4703\)](#)<sup>1</sup>

*Nature Communications* **Volume 10**, Article number: 899 (2019)



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# Summary

- ▶ Prospective and Retrospective studies have established safety
- ▶ Multiple studies indicate a survival benefit
- ▶ Registry and RCT will help further define the role of IRE in pancreatic cancer

# Thank you

The Miami Cancer  
Institute



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