IL FUTURO È ORA:

centri di eccellenza a confronto
nel trattamento dei tumori uro-oncologici

30 Settembre 2021
ore 9:00

ROMA NAPOLI BARI COSENZA PALERMO

Responsabile scientifico: Prof. Pierfrancesco Bassi

SESSIONE II: RENE

Moderatore: P. Bassi

Ruolo della realtà aumentata tridimensionale nella nefrectomia parziale assistita da robot.

S. Perdonà

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La realtà aumentata consiste nell'arricchimento della percezione sensoriale umana mediante informazioni, in genere manipolate e convogliate elettronicamente, che non sarebbero percepibili con i cinque sensi.

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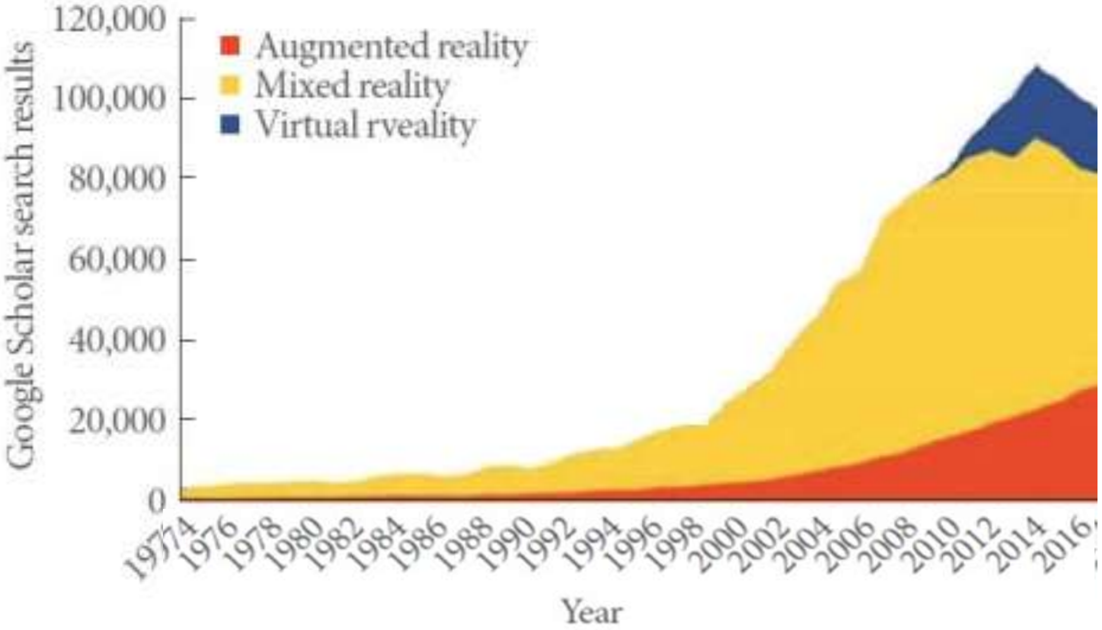


Keyword occurrence.

Google Scholar

‘Augmented Reality in Operating Room’

1995 - Operating microscope

- First attempt by Edwards et al. 1995 at Guy’s Hospital, London
- External mount, stereo view

1996 - AR on External Monitor

- Kikinis, Jolesz, Grimson, et al 1996 at Brigham and Women’s Hospital
- Mono, external mount

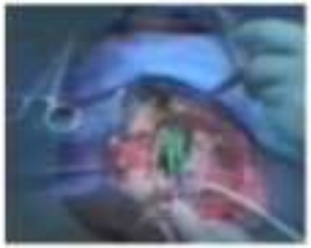
2000 - Operating binocular

- Birkfellner, Figl et al. 2000:

Varioscope AR at Vienna General Hospital

2000 - Head mounted display

- Sauer et al. 2000 at Siemens Corporate Research, NJ
- Stereo video see through

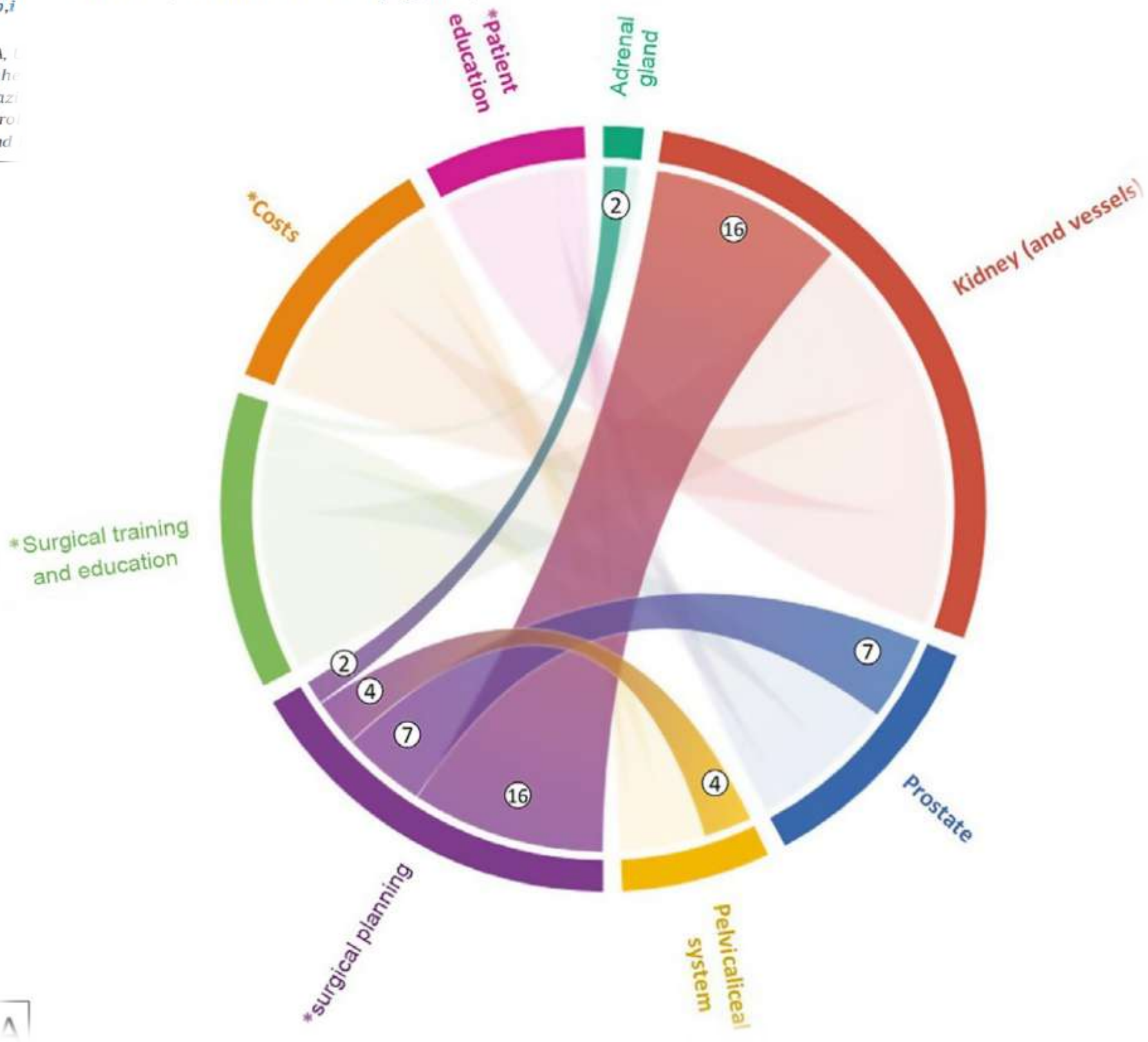


Review – Education

Impact of Three-dimensional Printing in Urology: State of the Art and Future Perspectives. A Systematic Review by ESUT-YAUWP Group

Giovanni E. Cacciamani [a,b,*], *Zhamshid Okhunov* [b,c], *Aurus Dourado Meneses* [b,d], *Moises Elias Rodriguez-Socarras* [b,e], *Juan Gomez Rivas* [b,f], *Francesco Porpiglia* [g], *Evangelos Liatsikos* [h], *Domenico Veneziano* [b,i]

[a] *USC Urology Institute, University of Southern California, Los Angeles, CA,*
(YAU) Working Party of the European Association of Urology (EAU), Arnh
USA; [d] *Department of Urology, Camargo Cancer Center, Sao Paulo, Braz*
Urology, Hospital Universitario la Paz, Madrid, Spain; [g] *Department of Uro*
Urology, University of Patras, Patras, Greece; [i] *Department of Urology and*



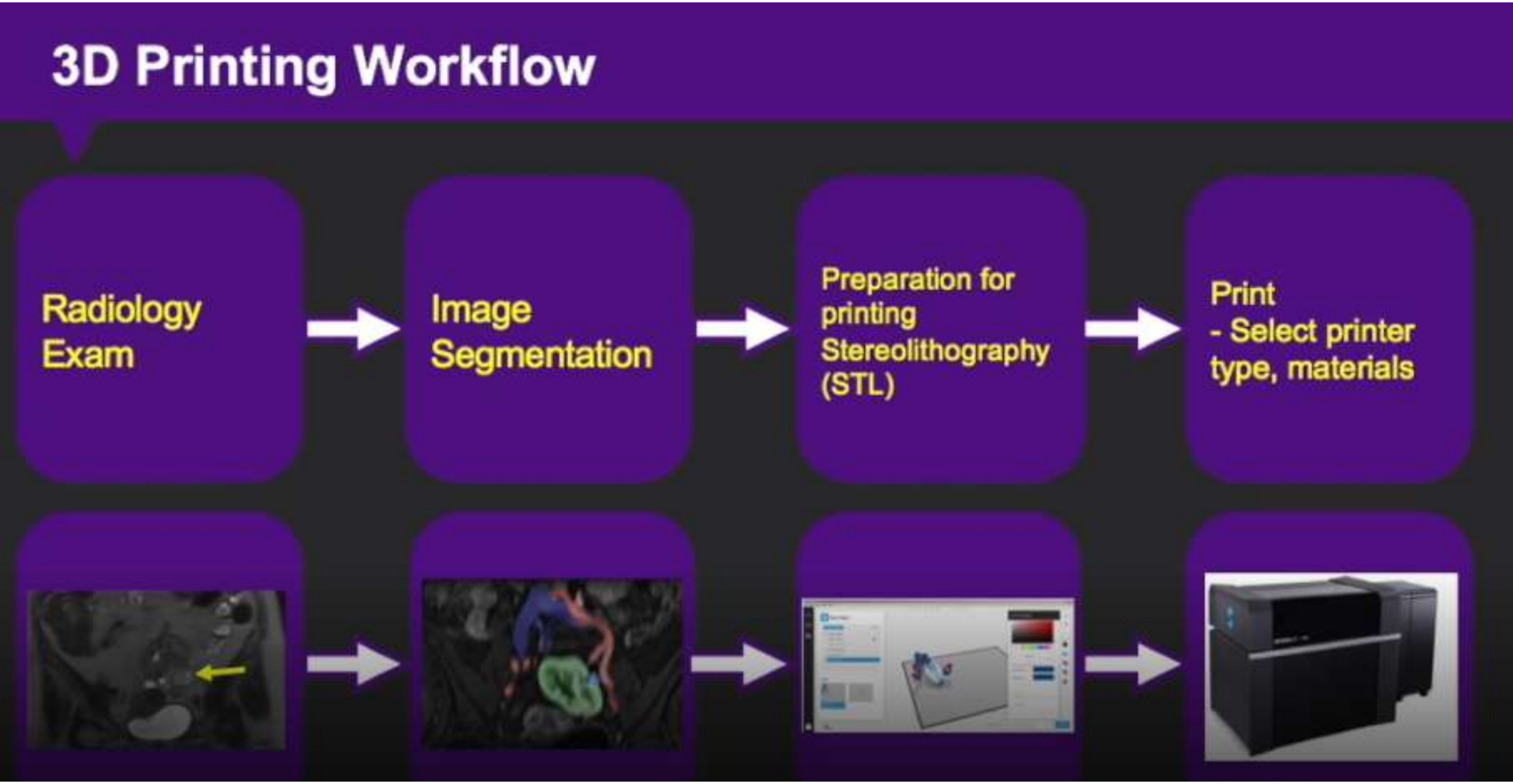
Acquisizione Immagini

Segmentazione

Modello 3D Virtuale

Approvazione del medico

Produzione Device



3D Printing Workflow

Radiology Exam

Image Segmentation

Preparation for printing Stereolithography (STL)

Print
- Select printer type, materials

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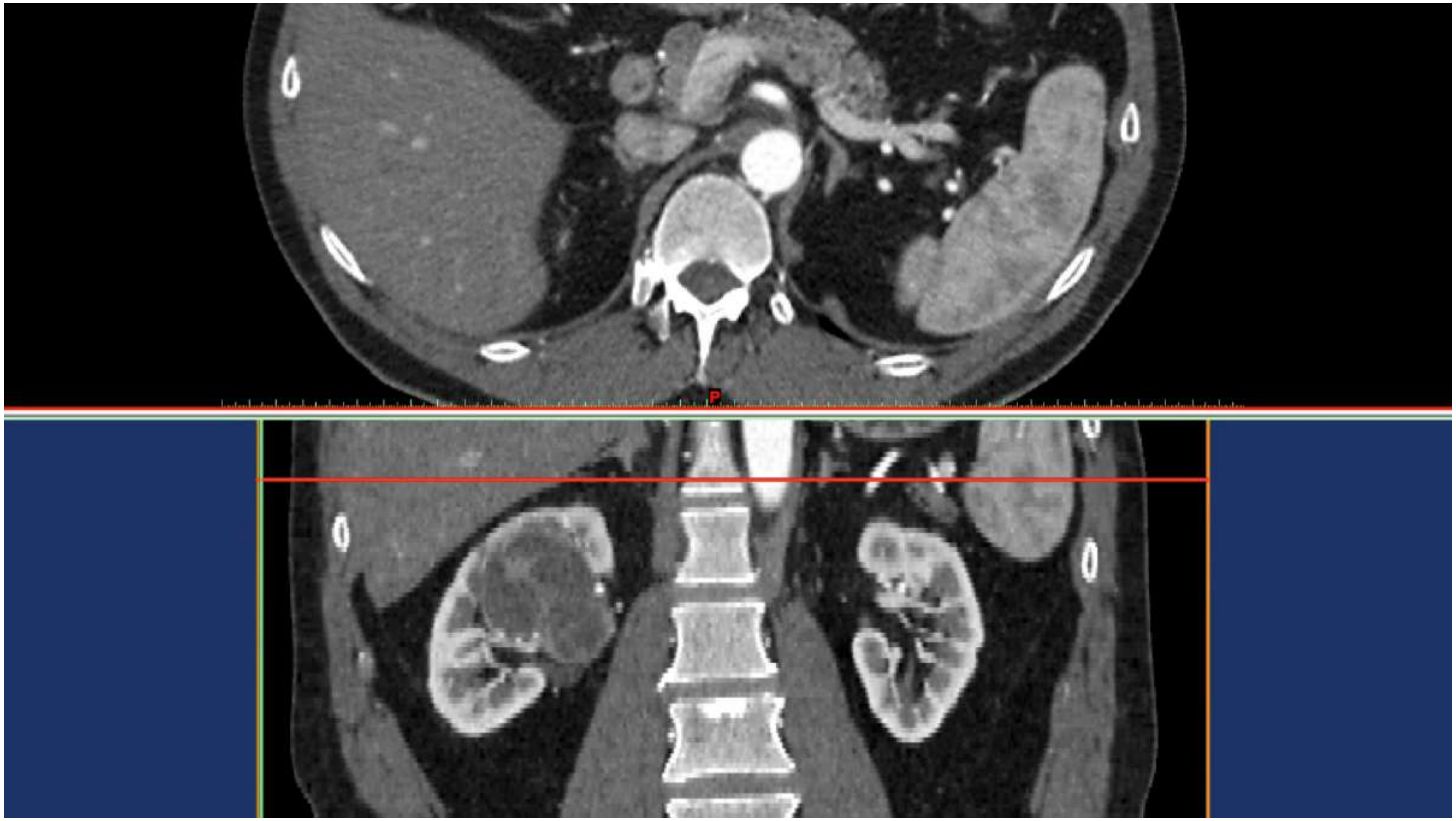
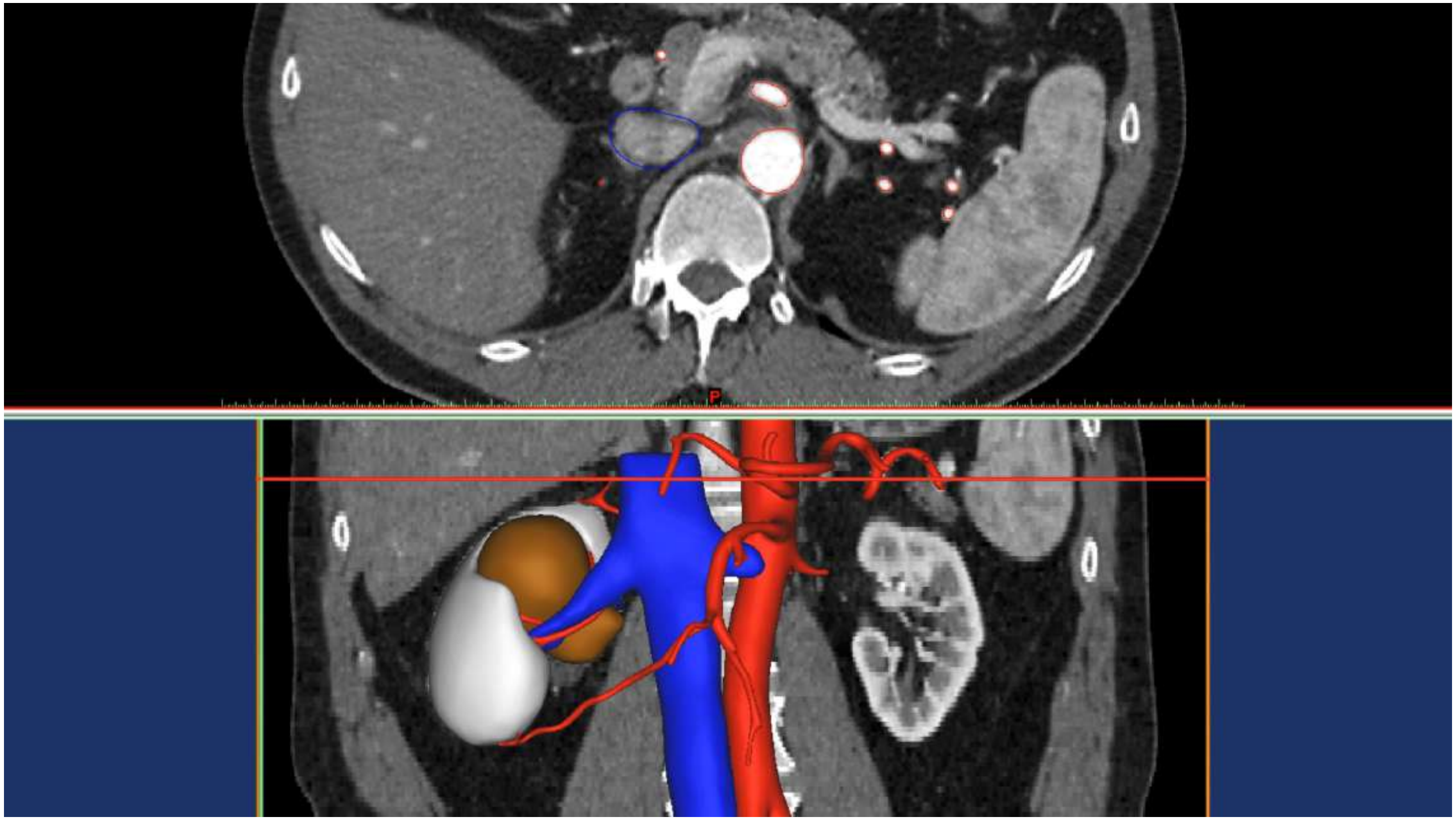
Le immagini vengono acquisite attraverso uno specifico protocollo di acquisizione

Acquisizione
Immagini



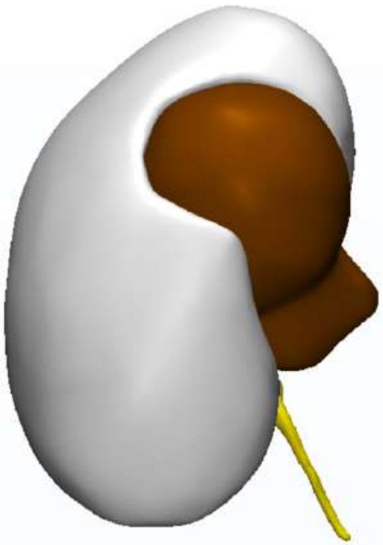
Le diverse strutture anatomiche vengono identificate e separate

Segmentazione

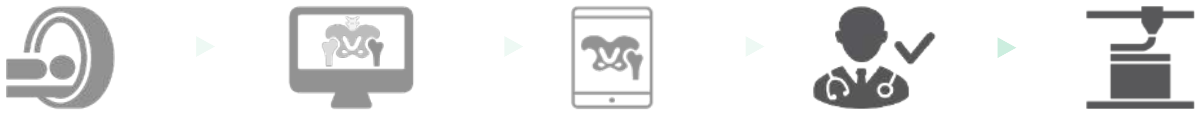


I dati vengono ricostruiti in 3D in un modello navigabile e interattivo

Modello 3D
virtuale

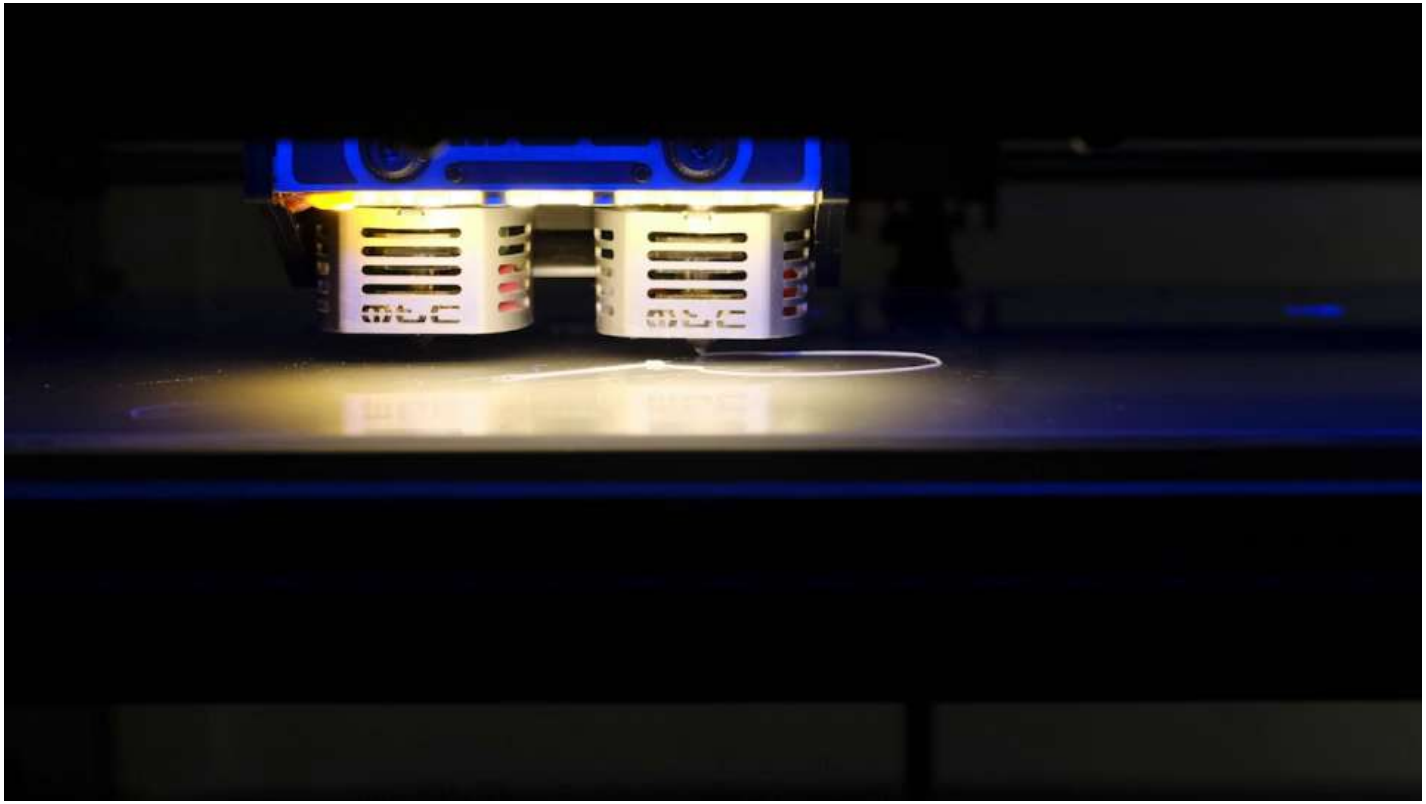


Una volta approvato il progetto di stampa del device con il medico, il device viene prodotto



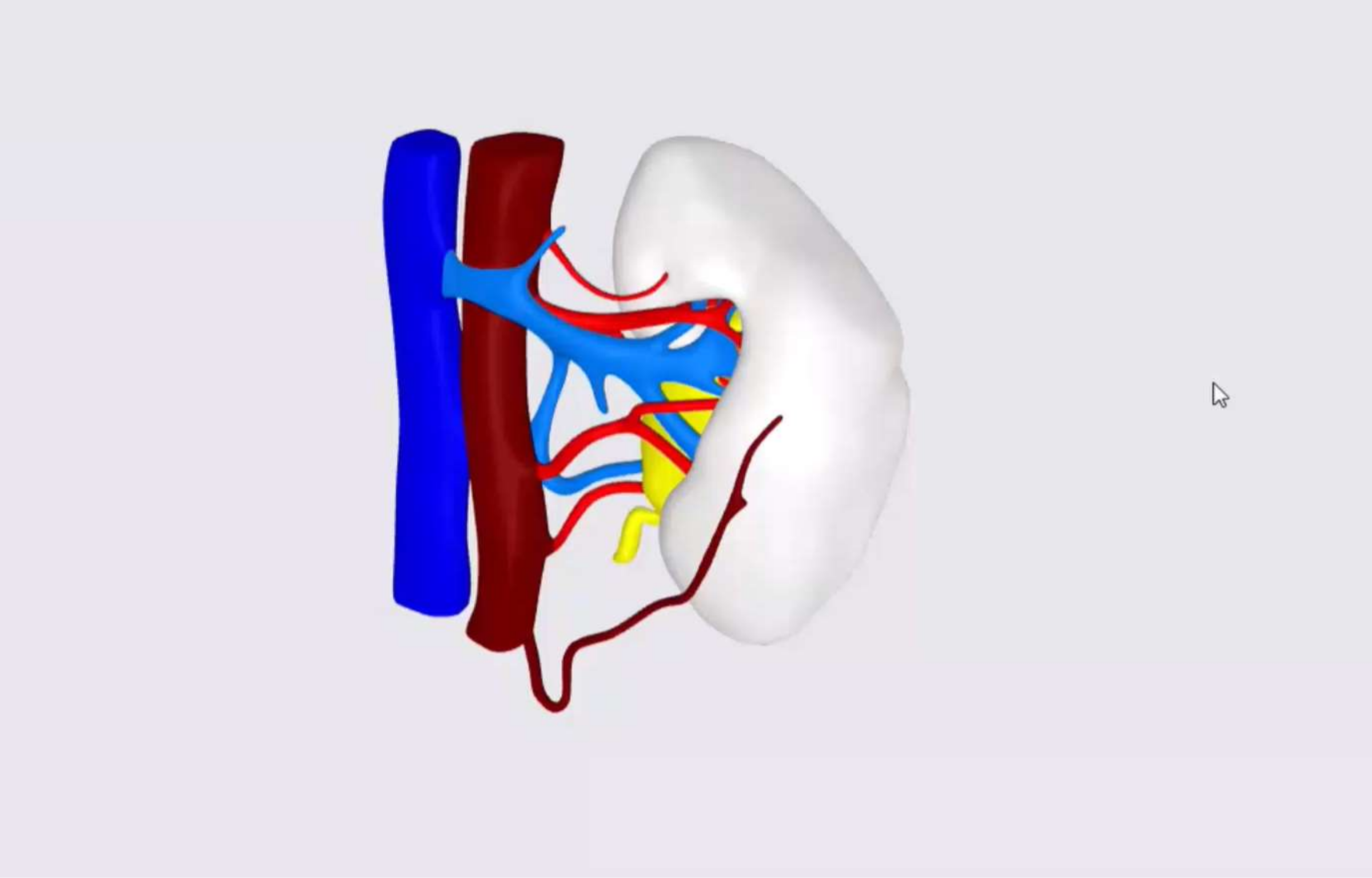
Conferma
del medico

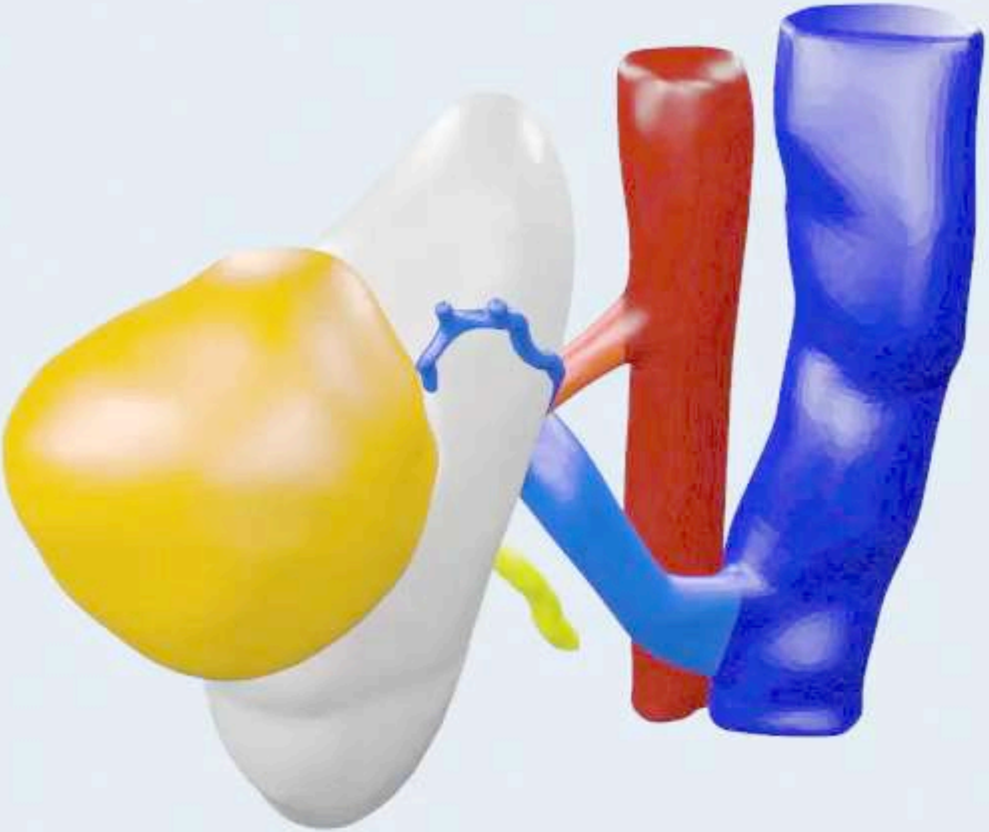
Produzione
Device

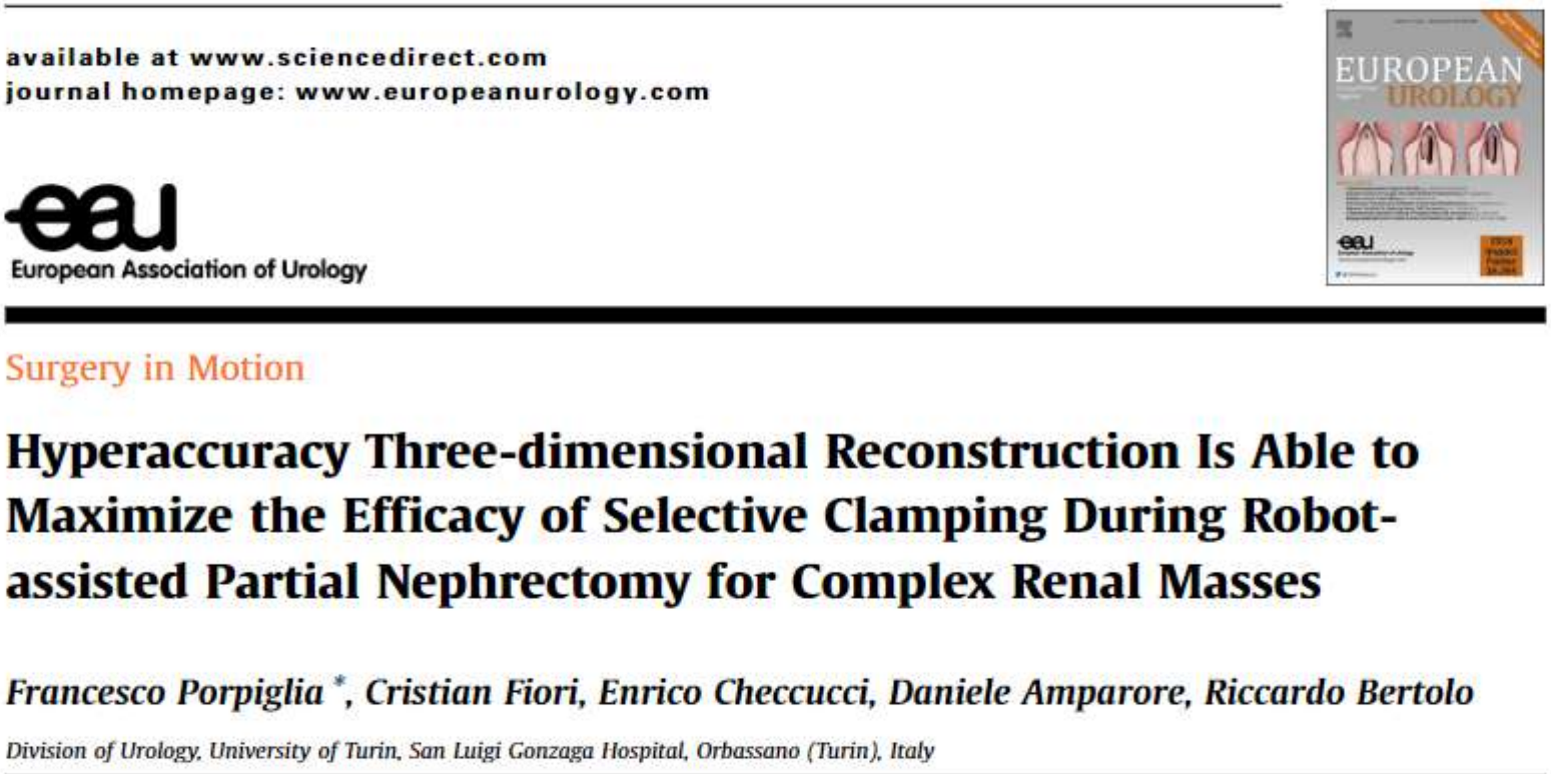


HA3D™ Virtual Model Pre-operative planning

MyMedics platform Pre-operative planning.







available at www.sciencedirect.com
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European Association of Urology

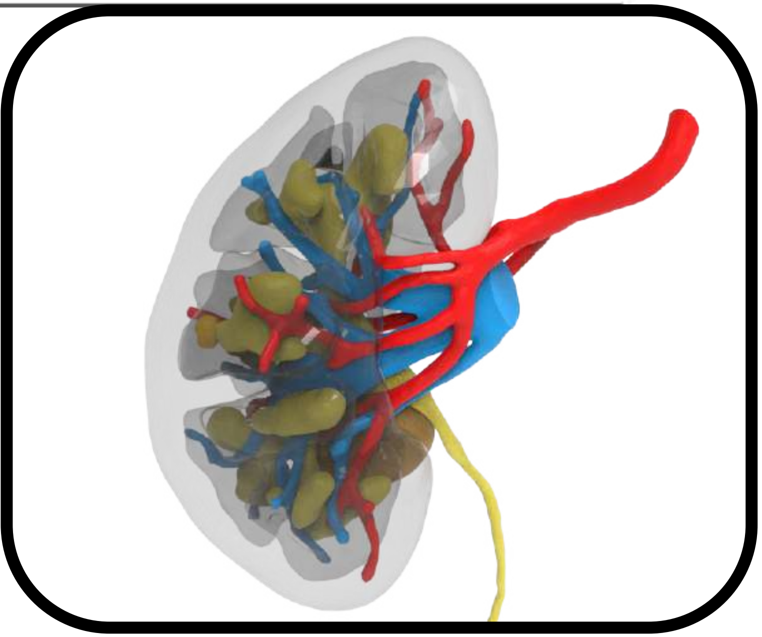
Surgery in Motion

Hyperaccuracy Three-dimensional Reconstruction Is Able to Maximize the Efficacy of Selective Clamping During Robot-assisted Partial Nephrectomy for Complex Renal Masses

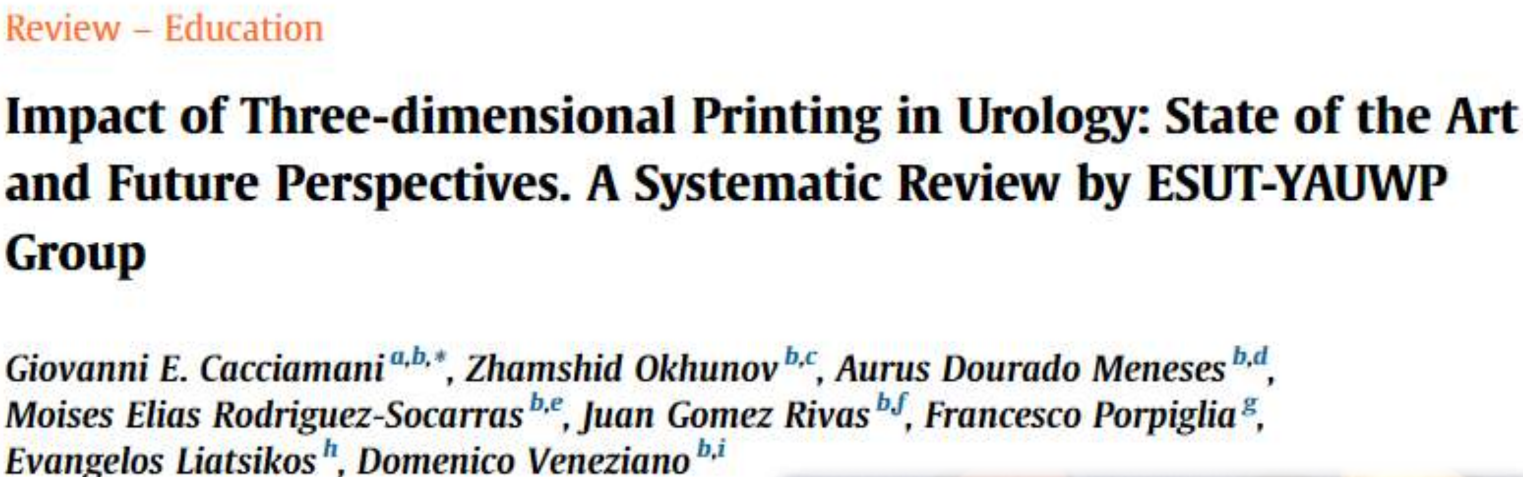
*Francesco Porpiglia *, Cristian Fiori, Enrico Checcucci, Daniele Amparore, Riccardo Bertolo*

Division of Urology, University of Turin, San Luigi Gonzaga Hospital, Orbassano (Turin), Italy

CONCLUSIONS: La simulazione preoperatoria dell'ischemia selettiva è risultata fattibile ed efficace con la ricostruzione HA3D. In tutti i casi RAPN eseguiti, il clampaggio selettivo ha avuto successo, evitando l'ischemia del parenchima renale sano. Una stretta collaborazione tra urologi e bioingegneri è necessaria per migliorare questa tecnologia.



European Association of Urology



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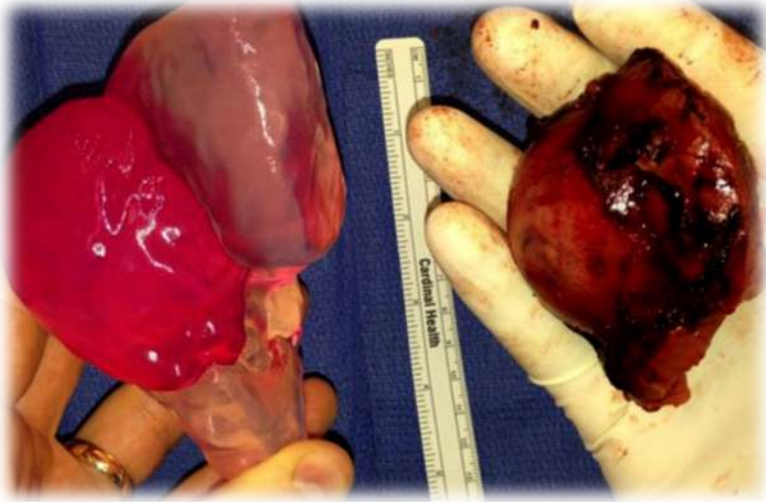

CONCLUSIONS: Three-dimensional printing shows revolutionary potentials for patient counseling, pre- and intraoperative surgical planning, and education in urology. Together with the ***"patient-tailored" presurgical planning***, it puts the basis for 3D-bioprinting technology. Although costs and "production times" remain the major concerns, this kind of technology ***may represent a step forward to meet patients' and surgeons' expectations.***

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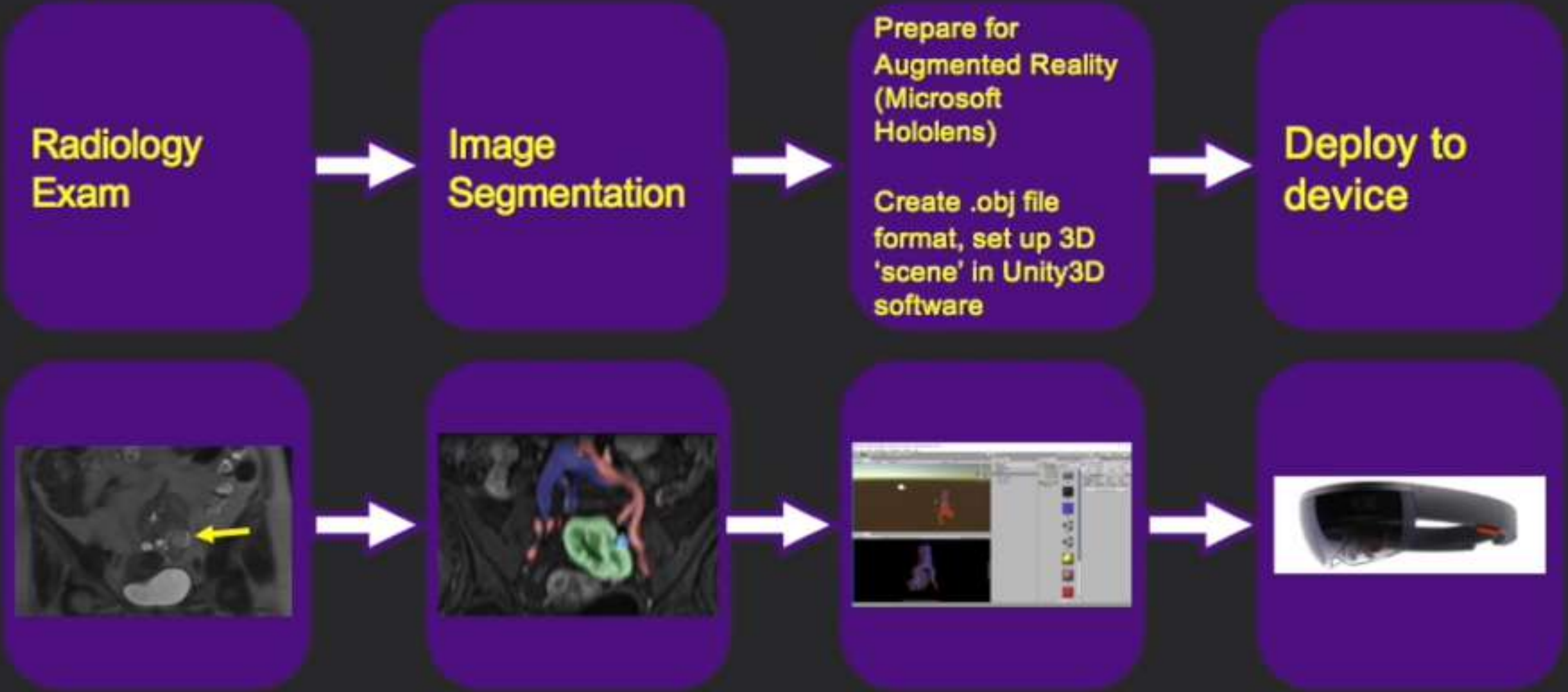
Augmented Reality Workflow



Radiology Exam → Image Segmentation → Prepare for Augmented Reality (Microsoft Hololens)

Create .obj file format, set up 3D 'scene' in Unity3D software → Deploy to device

L'immagine TC preoperatoria è stata segmentata manualmente per generare un modello di superficie 3D del rene, del tumore e del sistema collettore

Trasferimento accurato dell'immagine segmentata del rene 3D-CT sopra il video endoscopico

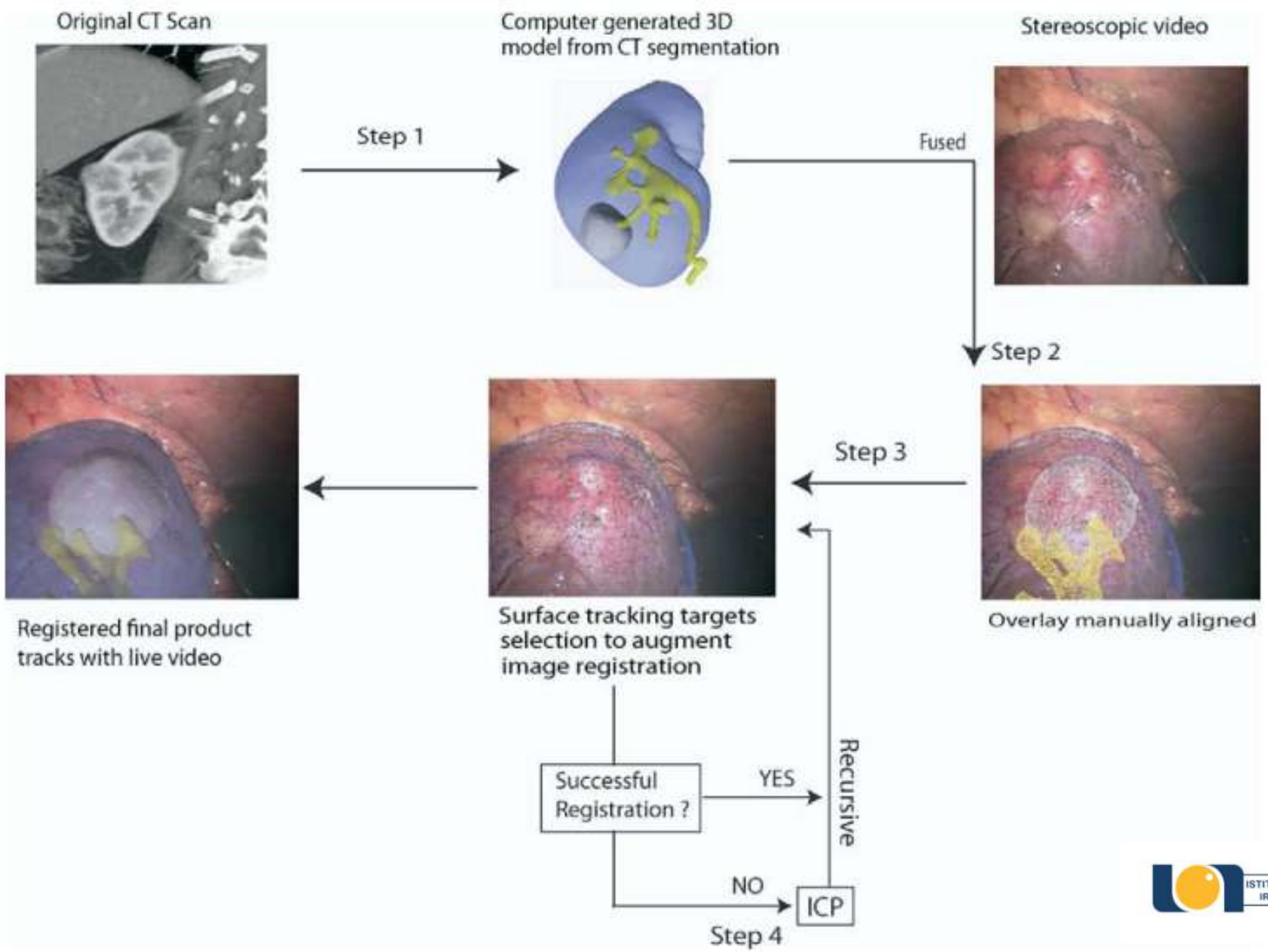

Original CT Scan
Step 1
Computer generated 3D model from CT segmentation
Fused
Stereoscopic video
Step 2
Step 3
Overlay manually aligned
Surface tracking targets selection to augment image registration
Registered final product tracks with live video
Successful Registration ?
YES
NO
ICP
Step 4
Recursive

Figure 1. Flowchart displaying intermediary steps needed to achieve successful three-dimensional registration of p
erative computed tomography image to live stereoscopic video.

COMING
Soon

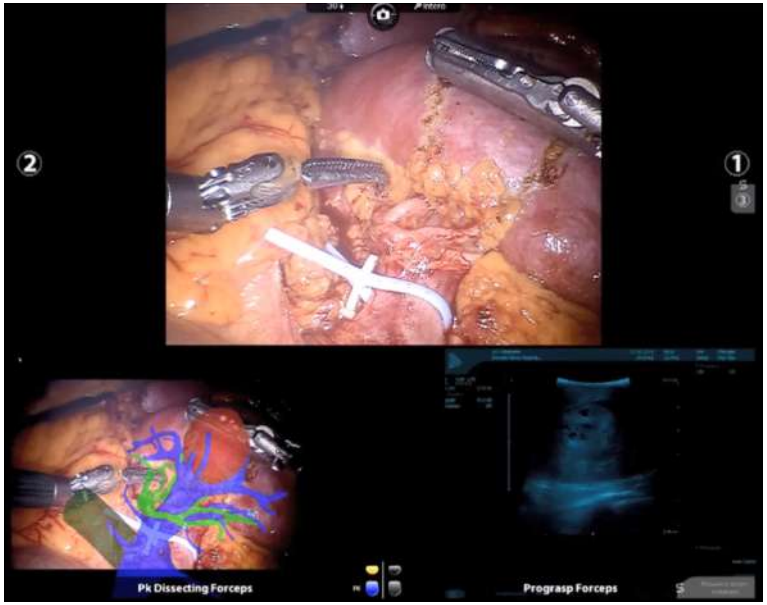
Augmented Reality - RAPN

European Association of Urology

Surgery in Motion

Three-dimensional Augmented Reality Robot-assisted Partial Nephrectomy in Case of Complex Tumours (PADUA ≥10): A New Intraoperative Tool Overcoming the Ultrasound Guidance

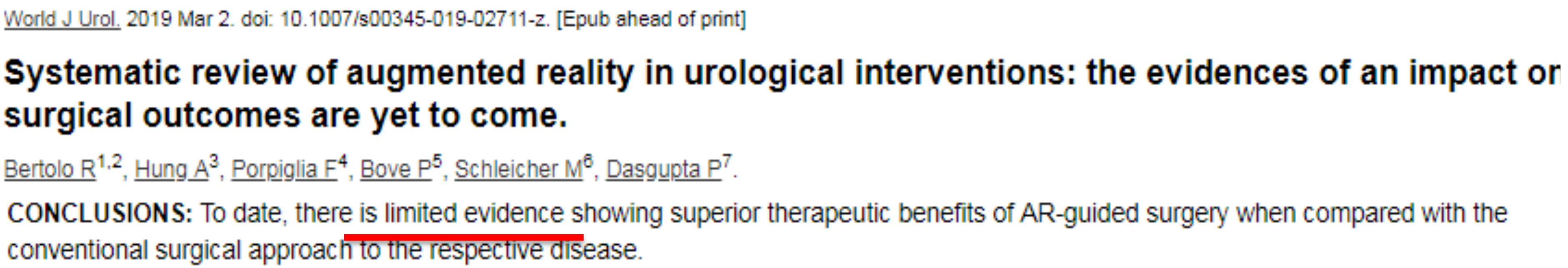
Francesco Porpiglia [a,], Enrico Checcucci [a], Daniele Amparore [a], Federico Piramide [a], Gabriele Volpi [a], Stefano Granato [a], Paolo Verri [a], Matteo Manfredi [a], Andrea Bellin [a],*



Obiettivo: Valutare l'accuratezza dei sistemi di Realtà Aumentata statica ed elastica HA3D nell'**identificazione di tumori e strutture intrarenali durante RAPN**, rispetto agli ultrasuoni standard (US).

Risultati: l'uso della guida 3D AR consente di identificare correttamente la lesione e le strutture intraparenchimali con una percezione 3D più accurata della posizione e della natura delle diverse strutture rispetto alla guida ecografica 2D standard ed un minore rischio di complicanze legate alla chirurgia.

Conclusioni: I modelli HA3D che si sovrappongono all'anatomia in vivo durante AR-RAPN per tumori complessi possono essere utili per identificare la lesione e le strutture intraparenchimali difficili da visualizzare solo con gli US



World J Urol. 2019 Mar 2. doi: 10.1007/s00345-019-02711-z. [Epub ahead of print]

Systematic review of augmented reality in urological interventions: the evidences of an impact or surgical outcomes are yet to come.

Bertolo R[1,2], Hung A[3], Porpiglia F[4], Bove P[5], Schleicher M[6], Dasgupta P[7].

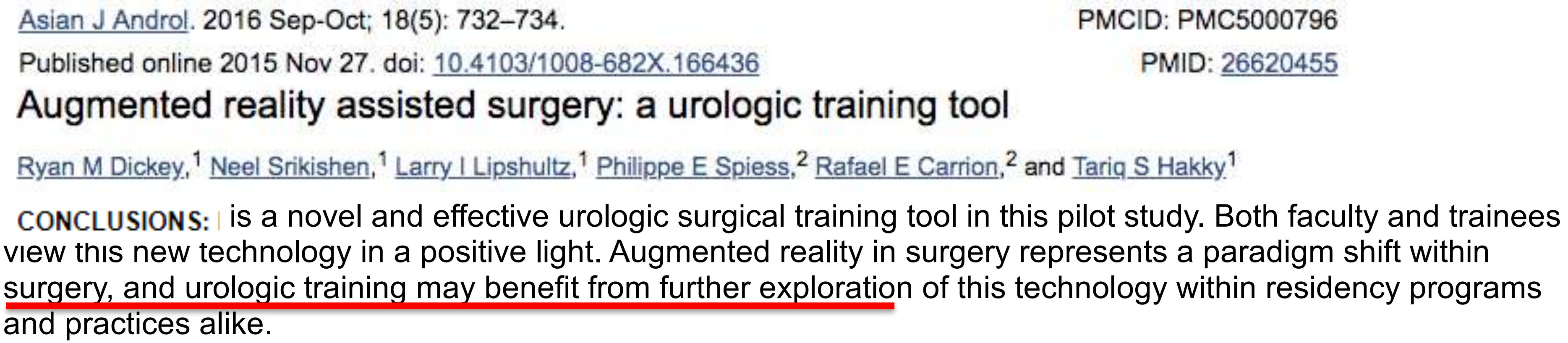
CONCLUSIONS: To date, there is limited evidence showing superior therapeutic benefits of AR-guided surgery when compared with the conventional surgical approach to the respective disease.

World J Urol. 2018 Feb;36(2):201-207. doi: 10.1007/s00345-017-2126-1. Epub 2017 Nov 10.

Development and validation of 3D printed virtual models for robot-assisted radical prostatectom and partial nephrectomy: urologists' and patients' perception.

Porpiglia F[1], Bertolo R[2], Checcucci E[2], Amparore D[2], Autorino R[3], Dasgupta P[4], Wiklund P[5], Tewari A[6], Liatsikos E[7], Fiori C[2]; ESUT Research Group.

CONCLUSIONS: In our experience, 3D printing technology has been perceived as a useful tool for the purpose of surgical planning, physici education/training and patient counseling. Further researches are expected to increase the level of evidence.



Asian J Androl. 2016 Sep-Oct; 18(5): 732–734. PMCID: PMC5000796

Published online 2015 Nov 27. doi: 10.4103/1008-682X.166436 PMID: 26620455

Augmented reality assisted surgery: a urologic training tool

Ryan M Dickey,[1] Neel Srikishen,[1] Larry I Lipshultz,[1] Philippe E Spiess,[2] Rafael E Carrion,[2] and Tariq S Hakky[1]

CONCLUSIONS: is a novel and effective urologic surgical training tool in this pilot study. Both faculty and trainees view this new technology in a positive light. Augmented reality in surgery represents a paradigm shift within surgery, and urologic training may benefit from further exploration of this technology within residency programs and practices alike.

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

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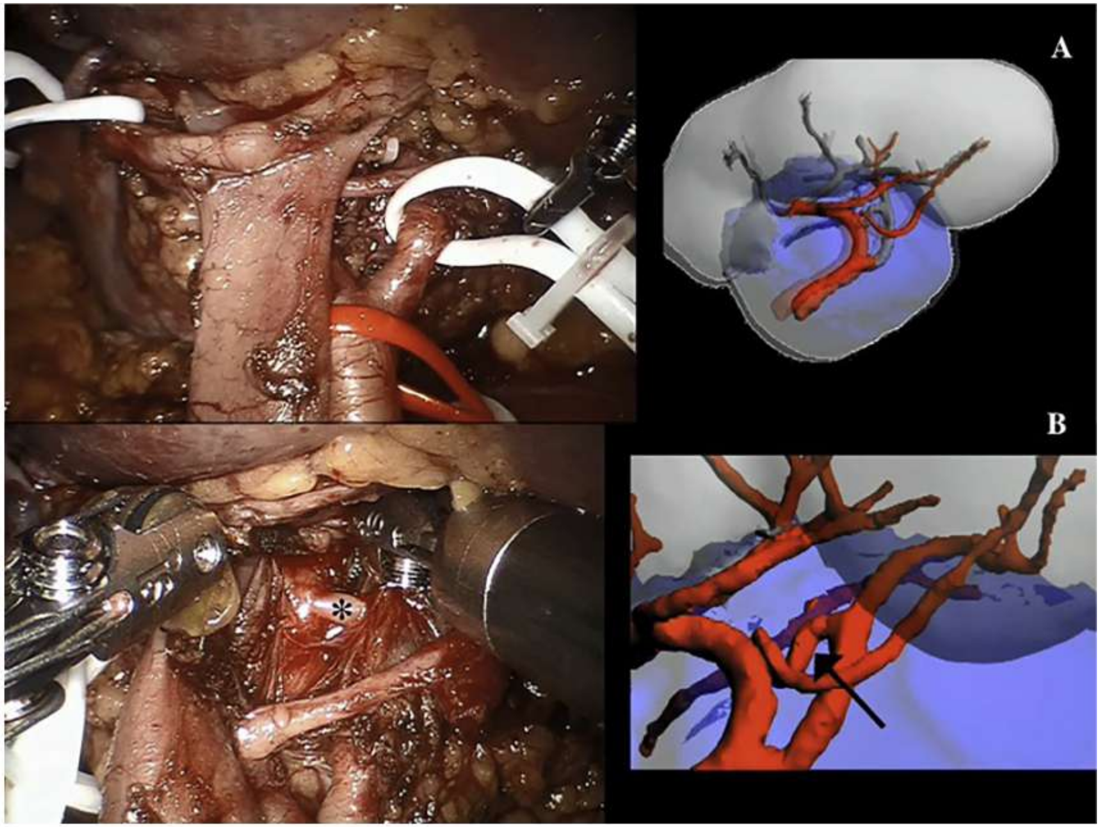
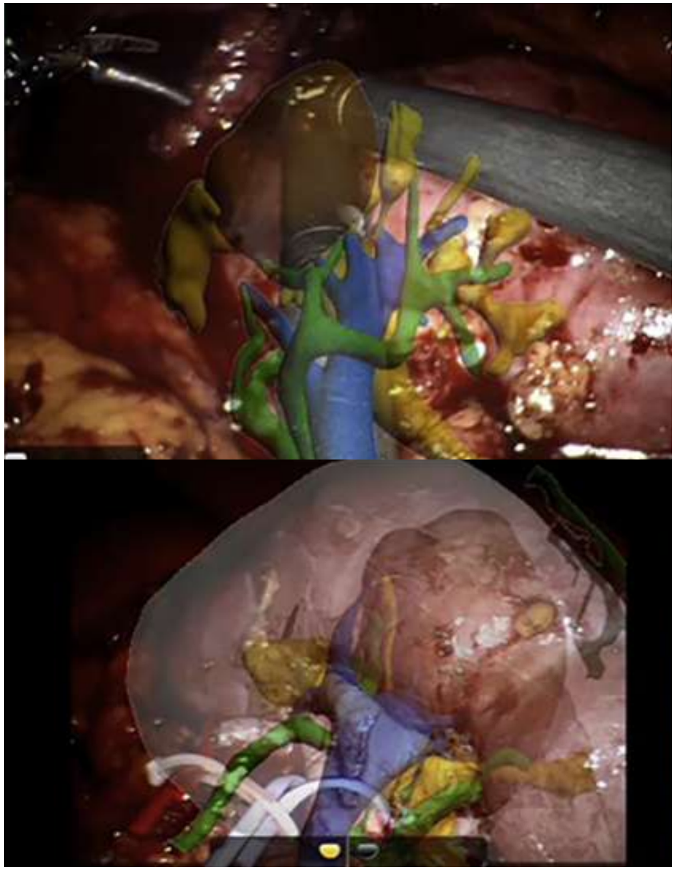
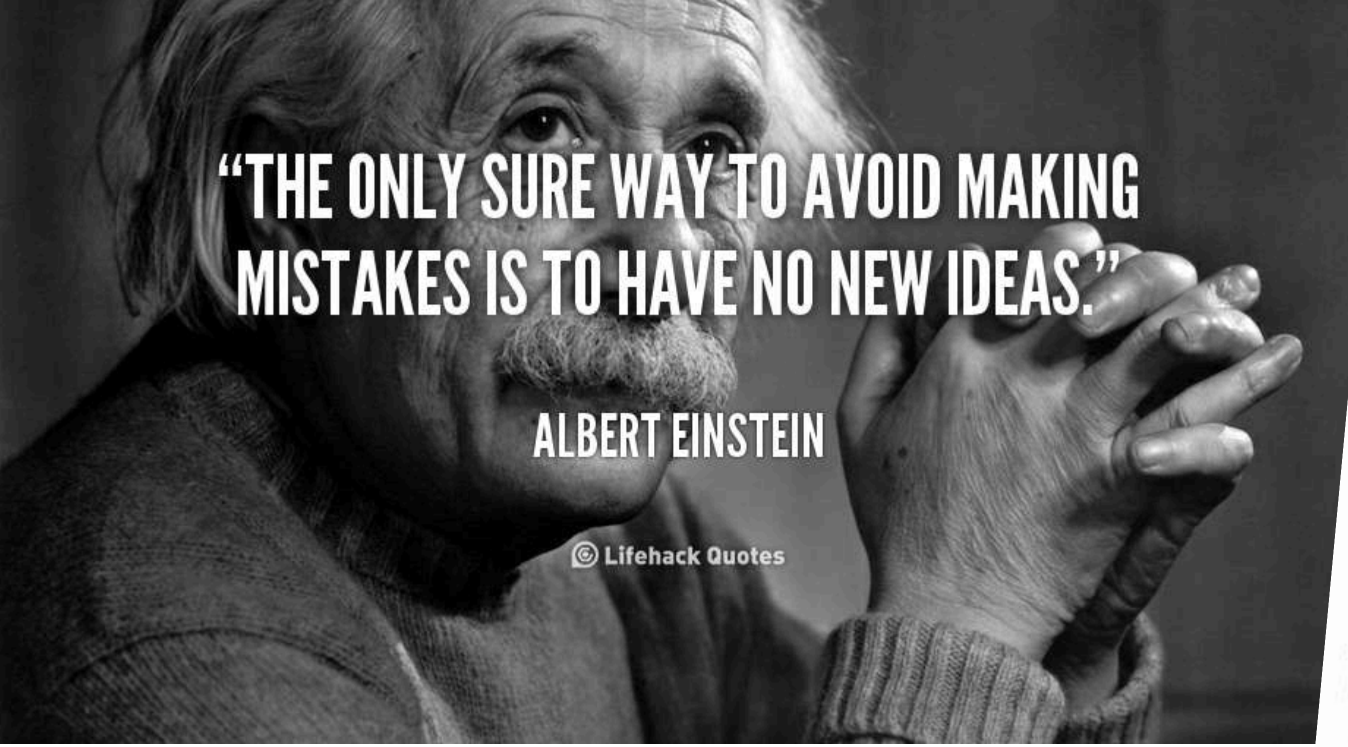


Fig. 3 – Complex renal pedicle dissection aided by the hyperaccuracy 3D reconstruction: (A) isolation of the renal arterial branches is completed by using vessel loops; (B) tumor dedicated feeding artery is identified (*).



Conclusions: HA3D virtual navigation ha consentito una rappresentazione fedele della vascolarizzazione arteriosa renale. La simulazione preoperatoria dell'ischemia selettiva è risultata fattibile ed efficace


"THE ONLY SURE WAY TO AVOID MAKING MISTAKES IS TO HAVE NO NEW IDEAS."
ALBERT EINSTEIN
© Lifehack Quotes

SO, WHAT'S THE TAKE HOME MESSAGE?
UMMM...
FIRST DRAFT
2017

- Appare una metodica sicura ed efficace
- La realtà aumentata (AR) può avere un ruolo significativo sulla programmazione chirurgica in particolare in merito al clampaggio superselettivo nelle RAPN
- AR ha dimostrato di avere un potenziale importante in merito alla gestione intraoperatoria della chirurgia conservativa renale

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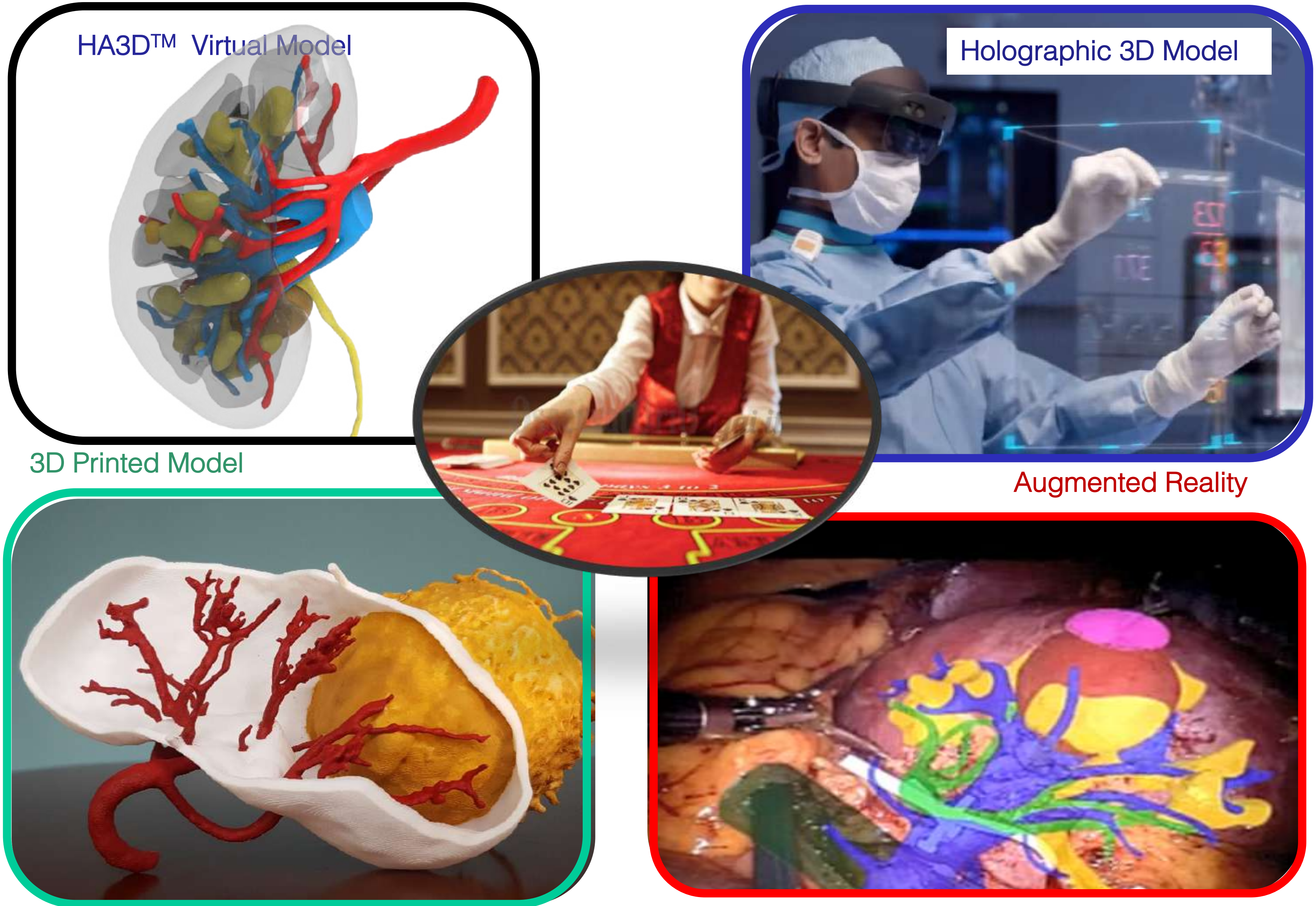
Le principali modalità di imaging aggiuntive per migliorare l'input visuo-tattile e la relazione del tumore con le strutture circostanti sono:



HA3D™ Virtual Model

Holographic 3D Model

3D Printed Model

Augmented Reality