**VALUE OF PARATHYROID SONOGRAPHY IN DIALYSIS PATIENTS IN DIAGNOSIS AND TREATMENT OF SECONDARY HYPERPARATHYROIDISM**

Drasko Pavlovic, Hrvojka Tomic Brzac
1 Sestre Milosrdnice University Hospital, Vinogradska c.29, 10000 Zagreb, Croatia
2 University Hospital Zagreb, Kaptolica 12, 10000 Zagreb, Croatia

Corresponding author:
Drasko Pavlovic M.D., Ph.D.
Sestre Milosrdnice University Hospital
Vinogradska c.29
10000 Zagreb
Croatia
Email: drasko.pavlovic@hls-reduh.hr
Tel: ++385 1 3787278

**Introduction**

Secondary hyperparathyroidism (SHPT) is a well-known complication in patients with chronic kidney disease (CKD). Bone and mineral disorders, increased morbidity and mortality are the consequences of SHPT in these patients, particularly in K/DOQI stage 5. Therefore, prevention and control of hyperparathyroidism is one of the main objectives in the management of CKD patients, particularly in dialysis patients (1).

The factors involved in the pathogenesis of SHPT are phosphate retention, decreased serum levels of calcitriol, and hypocalcemia. The role of fibroblast growth factor 23 (FGF 23), the recently discovered phosphaturic factor, in SHPT pathogenesis is not yet completely understood, but it is known that FGF 23 suppresses active vitamin D production in the kidney and may predict future development of refractory hyperparathyroidism in dialysis patients (2). SHPT is not only a state of increased PTH synthesis and secretion but, more importantly, is characterized by abnormal growth of the parathyroid gland, i.e. hyperplasia (3). Pathogenesis of parathyroid gland hyperplasia in CKD is not completely understood. Phosphate retention, hypocalcemia and reduced levels of calcitroil are all involved in parathyroid hyperplasia. The recent work of Dusso et al. sheds new light on the pathogenesis of parathyroid hyperplasia (4). The enhanced parathyroid expression of transforming growth factor alpha (TGF-α) and epidermal growth factor receptor (EGFR) probably play the most significant role in parathyroid hyperplasia. Hyperplasia of the parathyroid gland in CKD patients is initially diffuse and polyclonal. Later, nodular changes develop (i.e., monoclonal hyperplasia). From the clinical point of view, hyperplastic parathyroid glands are larger than normal, PTH levels are higher, there is significant reduction in vitamin D receptor (VD3), and calcium sensing receptor (CaR) density, there is increased basal...
VALUE OF PARATHYROID SONOGRAPHY IN DIALYSIS PATIENTS IN DIAGNOSIS AND TREATMENT OF SECONDARY HYPERPARATHYROIDISM

Figure 1
Figure 2
Figure 3
Figure 4
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9
Figure 10
Figure 11
secretion of PTH, and there is an upward shift of the calcium–PTH curve. The result is that medical treatment of such patients is very often unsatisfactory (5).

Serum concentrations of intact parathyroid hormone (iPTH) currently are the primary parameter for assessment of parathyroid gland over activity. Morphologic assessment of the parathyroid glands in terms of size and shape (i.e., looking for parathyroid hyperplasia) plays an important role in the diagnosis of SHPT in current practice.

Parathyroid ultrasound

Various noninvasive methods such as scintigraphy, computed tomography, magnetic resonance imaging and ultrasonography have been used for the identification and localization of parathyroid glands. Each method has its advantages and disadvantages.

In our hospital we began to employ ultrasound in the diagnosis of parathyroid gland disorders about thirty years ago. Back then we used a 3.5 or 5 MHz probe to search for and display enlarged parathyroid glands (Figure 1). We believed that it was important for the surgeons to know the localization of the parathyroid gland prior to surgery in order to allow them to plan the procedure and carry it out as safely and quickly as possible (6).

Since that time our understanding of the pathogenesis of secondary hyperparathyroidism and especially of hyperplasia of the parathyroid glands, has advanced significantly. Today, ultrasonography with 7.5 or 10 MHz linear small part probes and color Doppler are used routinely in the follow-up of our dialysis patients.

Using modern ultrasound equipment, we are able to display enlarged parathyroid glands (Figures 2 and 3) and to measure all three dimensions (a, b, c) and calculate the volume (according to the formula $V=\frac{a \times b \times c}{6}$) with a satisfactory level of accuracy.

Hyperechogenic areas, most likely indicating nodules, in the parathyroid gland, can often be observed in the parathyroid glands and the type of parathyroid gland hyperplasia. Ultrasonography has sufficient specificity to determine not only the localization but also the size and shape of the parathyroid glands and the type of parathyroid gland hyperplasia.

References

Device Could Lower Graft Failure Risk
Weekly monitoring of graft access blood flow predicted impending graft failure with 62% sensitivity.

These grafts is a leading cause of morbidity and it significantly increases overall costs for managing hemodialysis patients.

With the FloMon instrument, a probe is placed directly on top of the graft and three receivers surround a 14 mm diameter central transmitter. A laptop computer is used for data input and storage. The computer displays and calculates the amount of blood at each velocity and provides the sum as the total flow. Bench tests have shown flow-volume errors of less than 3%.

For this trial, 89 patients were randomized into control and monitored groups. The control patients received standard access monitoring once a month as recommended by Kidney Disease Outcome Quality Initiative guidelines. The monitored group had graft blood flow measured weekly with the FloMon device. The average monitoring, performed prior to dialyzing, required only 96 seconds. The investigators defined impending graft failure as a reduction in flow rate to below 550 mL/min or a decline of more than 25% in a week.

Clinical outcomes
In the first 332 patient-months in the control group, 18 grafts failed. In the first 286 patient-months in the monitored group, 13 grafts failed or showed impending failure. In the monitored group, eight impending failures were detected using the monitoring device, a sensitivity of 62%. Of the five failures missed, three were because of patient non-compliance, one occurred before a baseline flow could be established, and one occurred when a falling flow was not noted. A total of five "false alarms" were noted in the monitored group, for a false-alarm rate of 0.21 per patient-year. Weekly measurements using the FloMon device in hemodialysis patients with PTFE grafts has the potential to save more than $1,000 per patient-year, the researchers reported.

"We conducted this study at three different dialysis centers," said lead investigator Fidalene Cepeda. "We take three measurements and we chart those measurements every week. Overall, we were able to detect 16 failures out of 30 grafts that were failing in the monitored group."

Monitoring by current KDOQI guidelines has been shown to be inadequate to detect graft failures, Cepeda said.

Longer lifespan possible
"This device may turn out to be something that can extend the life of a patient," Cepeda told Renal & Urology News. "Saving the graft will mean less time on dialysis, fewer adverse events for the patients and at the end of the day possibly a longer lifespan."
The device is expected to cost less than $10,000 and it can perform its monitoring in fewer than five minutes prior to dialysis.

The FloMon instrument uses 5 MHz Doppler ultrasound and, for now, is only available as an investigational device.


RRI’s 10th International Conference on Dialysis, Advances in CKD 2008, A HUGE SUCCESS!

Held at the grand luxury Fiesta Americana Grand Coral Beach Resort in Cancun, Mexico, the Renal Research Institute was proud to host its 10th International Conference on Dialysis January 15-17, 2008.

We celebrated this milestone with an exceptional program presented by 33 world class renowned speakers representing 11 countries, not shying away from those topics which are controversial or challenging.

By continuing to emphasize on the latest technologies and therapeutics in the field of Chronic Kidney Disease, as well as current issues facing the renal community, the conference provided and exceptional learning and interacting experience for all attendees.

Dr. Nathan W. Levin’s, Conference Chair, welcome address opened the Conference which was filled with the most interesting and thought provoking discussions. We featured two controversial debates, a special lecture and two keynote addresses by Dr. Eberhard Ritz which induced some fascinating talks.

Controversial debates:
• Drs. Madhukar Misra and Giuliano Brunori, on whether dialysis or a low protein diet is better in the management of elderly stage V CKD patients.
• Drs. Adeera Levin and Richard Amerling (Canada vs. USA) on the significance of guidelines in patient care and outcomes, have the guidelines done more harm than good?

A special lecture:
• Special Lecture by Dr. Alan S. Kliger entitled, “Ethical Nephrology Care: Are our incentives aligned properly”.

Keynote addresses:
• Dr. Eberhard Ritz on the role of metabolic syndrome in kidney disease and on prevention of sudden death.
NEW IN 2008:

Case discussion:
• Dr. Jose A. Diaz-Buxo Chaired and presented a case discussion on managing a complex PD patient.

Our first ever Poster Session:
• Presented during lunch, Wednesday and Thursday, the Poster session was a great success and we are looking forward to the session again in 2009 (Abstracts due September 1, 2008.)

The Best Abstracts:
• Following the final session of the conference, an oral presentation of the best abstracts was given by:
  – Georg Fleishman, MD
  – Franklin Mora, MD
  – Daniel Schneditz, PhD

Throughout the busy program, the schedule allowed for fun at the pool swim-up bar, a tropical cocktail on the beach, and even a surprise performance during the Welcome Reception by our pièce de résistance, The Kidney Stones, and still provided 18 CMEs.

Twenty-two outstanding exhibitors were on hand for the entire meeting. All sessions and meals were held next to the exhibitors which provided a great opportunity for interaction and networking. The RRI’s conference is organized as one continuous educational session where there are no competing topics with concurrent speakers, thus offering a great environment and unique atmosphere.

The International Society of Nephrology (ISN), the National Kidney Foundation (NKF), the Renal Physicians Association (RPA) and the International Society of Peritoneal Dialysis (ISPD) all have endorsed this meeting.

Our success over the past decade is solely due to you, our attendees, our world renowned speakers, our program committee members, our loyal exhibitors, our professional colleagues and our researchers who have tirelessly staffed this meeting.

More than 500 registrants participated this year including:
• Practicing and academic nephrologists
• Nephrology fellows-in-training
• New medical doctors
• Nurses and other healthcare professionals

Over 70% of attendees were nephrologists:

They came from all over the world:

Thank you from the bottom of our hearts and we look forward to seeing you January 28-30, 2009 in Las Vegas!
The Renal Research Institute would like to extend a grateful Thank You to the 2008 Sponsors and Exhibitors for their support:

Abbott
Aclavis International
AMAG Pharmaceuticals
American Regent Laboratories
American Society of Nephrology
Amgen
Asahi Kasei Medical America
Baxter
Dialysis & Transplantation
Fresenius Medical Care: Renal Therapies Group
Fresenius Medical Services
GenExel Sein, Inc.
Genzyme Renal
ICU Medical, Inc.
Integrated Biomedical Technology, Inc.
National Kidney Foundation
Nephro-Tech, Inc.
PhosLo
Renal Physicians Association
Spectra Laboratories
The Annex Group, Inc.
Watson Pharmaceuticals

PHYSICIAN CME ACCREDITATION

This activity has been implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship by the University of Minnesota and Renal Research Institute.

The University is accredited by the ACCME to provide continuing medical education for physicians. The University of Minnesota designates this educational activity for a maximum of 18 category I credits towards the AMA Physician’s Recognition Award.

CE ACCREDITATION

If requested, attendees will receive a Statement of Attendance which can be used by other healthcare professionals for requesting Continuing Education Units (CEUs) in accordance with state nursing boards, specialty societies, or other professional associations.

Contact:
Ingrid Adelsberger
Corporate Meeting Planner
Phone: 646-672-4073
Email: iadelsberger@rriny.com

Don’t miss our next UNIQUE educational event:

11th International Conference on Dialysis
ADVANCES IN CKD 2009
January 28-30
2009
CAESARS PALACE
LAS VEGAS
Specialized Poster Session
Abstracts due Sept. 1, 2008
For further information please visit: www.renalresearch.com
**SUSTAINABLE KIDNEY CARE FOUNDATION**

**PROVIDING DIALYSIS WHERE NONE EXISTS**

*Our goal is to create programs that are sustainable and allow countries we serve to continue to provide for their people long after our work has been completed.*

Currently we are working in the United Republic of Tanzania. Please help the thousands of women and children of Tanzania whose lives are cut short by the lack of treatment for acute kidney failure.

*Yes I would like to contribute:*

[ ] $25  [ ] $50  [ ] $100  [ ] Other_____________

*Please make your check or money order payable to:*

**Sustainable Kidney Care Foundation**

PO Box 287005
New York, NY 10128
631-523-1094
mary.carter@skcf.net

*Sustainable Kidney Care Foundation is a not for profit 501 (c) 3 public charity*

[www.skcf.net](http://www.skcf.net)
11th International Conference on Dialysis
ADVANCES IN CKD 2009

January 28-30
2009

CAESARS PALACE,
LAS VEGAS, NV

Abstracts due Sept. 1, 2008

See You In 2009!

For more information visit www.renalresearch.com