

## HYPERPARATHYROID CONTROL IN PD PATIENTS

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Bone is a dynamic tissue that is continuously undergoing re-modeling and turnover under the control of several mediators such as parathyroid hormone (PTH), but also numerous other growth factors and cytokines. In chronic renal failure, impaired renal phosphate excretion, lack of the active form of vitamin D<sub>3</sub>, the 1,25 (OH)-vitamin D<sub>3</sub> (calcitriol), and low calcium serum levels all contribute to hyperplasia of the hyperparathyroid glands and excess PTH secretion. Consequently, bone formation rate, as well as number and activity of both osteoclasts and osteoblasts are increased, ultimately leading to high-turnover bone disease and osteitis fibrosa cystica.



On the other hand, over-suppression of PTH with calcitriol and calcium overload via oral phosphate binders and/or high calcium dialysate may result in low-turnover bone disease that is characterized by an abnormally low bone formation rate accompanied by a defect in bone mineralization. This may either manifest in osteomalacia, characterized by an accumulation of unmineralized osteoid, or adynamic bone disease, with a paucity of cells and the absence of osteoid accumulation. A third variety of low-turnover bone disease is aluminium-related. Due to the decline in aluminium-containing phosphate binders, however, aluminium-related bone disease has become less frequent in recent years.

Little is known about the etiology of adynamic bone disease. The risk factors that have been proposed based on the results of cross-sectional clinical studies include age, malnutrition, diabetes, over suppression of PTH, iron deficiency, and male gender. Adynamic bone disease may be accompanied by severe bone pain, fractures, or vascular calcifications and thus may significantly impact on morbidity and mortality of PD patients.

Whilst in principle the approach to diagnosis and treatment of renal osteodystrophy in peritoneal dialysis patients is similar to that in hemodialysis patients, there are several aspects to consider in which these two patient groups may be differing:

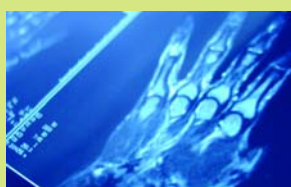
- (i) PD patients show a higher prevalence of adynamic bone disease.
- (ii) Unlike in HD, both vitamin D and parathyroid hormone are cleared in PD patients via the dialysate.
- (iii) The assessment of calcium balance in PD patients is complex as it depends on serum calcium and albumin levels, dialysate calcium concentrations, peritoneal water ultrafiltration, and peritoneal calcium dialysance in addition to dietary intake and type / dose of calcium binding agents.
- (iv) In PD patients, intravenous administration of vitamin D is impractical.
- (v) At a given level of PTH, calcium uptake in bone may be less in PD compared to HD patients<sup>1</sup>.

The gold standard in the differential diagnosis of the different types of renal osteodystrophy is to perform a bone biopsy, however, this may not be practical in all patients. Alternatively, clinical, laboratory, and radiological findings can be helpful to establish a diagnosis. In particular, a serum intact PTH level of <15.9 pg / ml is highly predictive (97%) of adynamic bone disease<sup>2</sup>. On the other hand, very high levels of iPTH (>48 pg / ml) are predictive of high-turnover bone disease<sup>3,4</sup>. In patients displaying iPTH levels in between these discriminatory thresholds the trend towards increase or decrease in 3-4 months intervals has been suggested to assist in differentiating the two forms of osteodystrophy<sup>5</sup>.

The treatment of secondary hyperparathyroidism should be initiated early in the course of chronic renal failure, that is, as soon as creatinine clearance falls below 50 ml/min. In this early stage the primary treatment is to control hyperphosphataemia and hypocalcaemia by dietary measures and the oral administration of calcium containing phosphate binders. According to the current K/DOQI guidelines<sup>6</sup>, the target values of serum phosphorus should be 1.13-1.78

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# PRE-DIALYSIS EDUCATION AND CARE – AN IMPORTANT FACTOR IN ESRD MANAGEMENT

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An informed person is an empowered person. Most people feel more in control when they understand what is happening around them. Dialysis patients are no different. Therefore, it is important to ensure that patients approaching end stage renal disease (ESRD) and their families are knowledgeable about the various options for renal replacement therapy.

Many patients start renal replacement therapy in an acute setting such as an emergency room, without previous information on dialysis, transplantation and general care of the renal patient and without the support of renal trained nurses and doctors in attendance. This scenario is not conducive to providing the patient with proper education or an understanding of dialysis. In addition, the psychological trauma that the patient experiences at this time may have adverse effects on how they accept the diagnosis, treatment and restrictions that are imminent with ESRD.



A major problem is early detection of renal failure. The chronic nature of this insidious disease means that the patients usually do not recognise the symptoms until it is too late. This scenario is not specific to any country, but is of even greater concern where there is a lack of dialysis units, access to nephrologists (particularly in rural areas or developing countries) and to patient education. According to the United States Renal Data System (USRDS)<sup>1</sup>, 39% of haemodialysis patients reported they were first seen by a nephrologist three months or less prior to starting dialysis and 26% reported they were seen less than one month prior. A patient that has not been seen by a nephrologist is not likely to know his therapeutic options or to select any other therapy than centre haemodialysis.

An intensive pre-ESRD education program can potentially improve patient survival, reduce cost and facilitate continuing employment of pre-ESRD patients<sup>2</sup>. There is little question that optimal pre-ESRD care involves early detection. Pre-dialysis education is most beneficial when the patient has been under the care of a physician prior to the start of dialysis. Patients with diabetes for instance, may be informed well enough in advance of their impending kidney failure, thus presenting the opportunity for an early referral to the nephrologist. The physician can recommend pre-ESRD education, however, unless the patient is ready to accept this fact, he or she may not seek early intervention. It is ultimately the patient's responsibility to seek information<sup>3</sup>. Obrador and Pereira demonstrated that when measures are taken to manage kidney disease at an early stage, people tend to experience fewer hospitalizations, have a

lower cost of care and experience better overall clinical conditions<sup>4</sup>. Another study showed that pre-dialysis education helped to reduce anxiety, the number of hospital days during the first month of dialysis and the number of acute initiation of dialysis. Their success was attributed to early referral partnered with a multidisciplinary approach<sup>5</sup>. Levin et al. found that multidisciplinary pre-dialysis programs reduced the need for urgent dialysis and the number of hospital days in the first month of dialysis. Early insertions of peritoneal catheters have also been shown to reduce the number of break-in procedures and catheter related complications, resulting in improved patient outcomes<sup>6</sup>.

According to the self-regulation theory, the provision of pre-procedural information facilitates coping by reducing the difference between expectations and actual experience<sup>3</sup>. The benefits of a pre-dialysis patient education program include being well informed at the initiation of dialysis, less fearful of the environment and procedures and better able to assimilate new information.

## *Implementing a pre-ESRD education program*

The participants in a multidisciplinary pre-education program should comprise:

- An experienced nephrologist confident with peritoneal dialysis, haemodialysis and renal transplantation who can offer an unbiased opinion
- A competent and experienced access surgeon or interventional nephrologist
- Nursing staff members representing PD, centre HD, home HD and transplantation
- A social worker
- A dietitian
- Representatives from the local patient kidney support group
- Other patients established on maintenance dialysis. It is very important that the participants can relate to someone who has been through the experience and can answer questions from the patient's perspective. Once again, a patient from each modality is ideal.

The format of these programs must be flexible and adaptable to the needs of the participants. The frequency of the workshops varies, but quarterly or more frequent offerings are recommended. An open forum with a small number of participants (preferably less than 15) is ideal so that the patients and their families and friends do not feel intimidated by the group and feel free to ask questions.

In South Asia Pacific the pre-dialysis education programs typically consist of four sessions, one night a week for two hours:

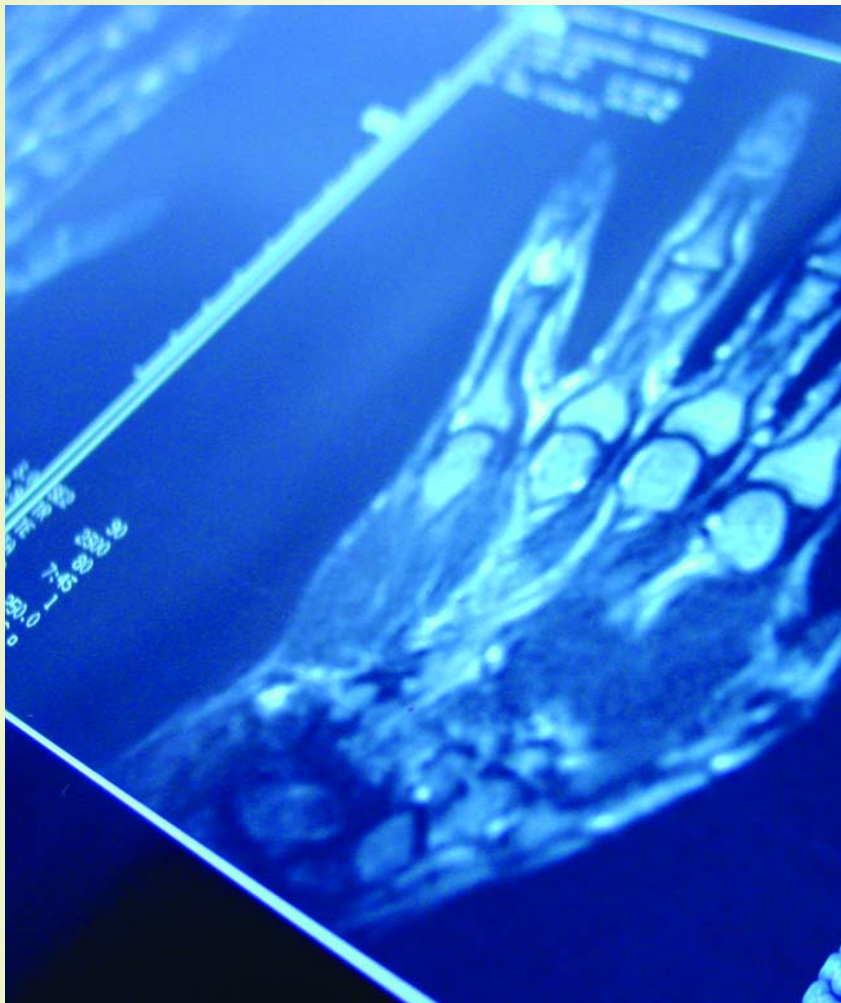
***Class 1: Renal Failure and its Consequences.*** A nephrologist or nurse speaks on the functions of the kidney, progression of renal disease and interventions to slow its progress. The dietitian addresses diet and fluid management. The social worker then discusses employment issues, sexual concerns, available social benefits and introduces the patient support group. A psychiatrist or psychologist may also speak. The patient is given literature to take home.

***Class 2: Introduction to Renal Replacement Therapy and Treatment Options.*** The nephrologist, and access surgeon discuss the suitability of patients for each modality. A demonstration of a CAPD exchange using a training apron is given. The patients are given the "Treatment Options" video and/or a booklet to take home and review with other family members. If the patient has internet access, they can review [www.kidneyoptions.com](http://www.kidneyoptions.com).

***Class 3: Informal Discussion.*** By this time, the patient has received all the take home materials and should have discussed it with their families. This class allows them to voice their questions

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mmol/L. In addition, serum calcium should always be normalized to  $<2.54$  mmol/L, and, ideally, to  $\leq 2.37$  mmol/L. In order to achieve these goals the intake of calcium from phosphate binders should be limited to 1.5 grams per day. In addition, elevated iPTH levels should be treated with calcitriol to reach a target of 15.9-31.8 pmol/L (150-300 pg/ml). Pulse administration does not appear to be superior to daily oral dosing when equivalent weekly doses are given<sup>7</sup>, however, in the presence of hyperphosphataemia and iPTH less than twice the upper limit of normal, pulse therapy is contraindicated<sup>8</sup>. If PTH does not respond to treatment and hypercalcemia is persisting, parathyroidectomy is the treatment of choice.



In the presence of established adynamic bone disease treatment may result in excessive calcium x phosphate product ( $>4.42$  mmol<sup>2</sup>/L<sup>2</sup>), entailing a considerable risk that patients develop metastatic calcifications. In these patients, using low-calcium PD fluids should lower serum calcium. At the same time strict phosphate control should be achieved by using non-calcium, aluminium-free phosphate binders such as sevelamer. Moreover, emphasis should be given to maintaining optimal acid-base control. In addition to oral bicarbonate supplementation, the type and concentration of buffer in PD fluids should be individualized. To this end, PD solutions based on bicarbonate buffer which have recently become available in some countries may be considered<sup>9,10</sup>.

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**GEMS**

## PROPHYLACTIC USE OF MUPIROCIN MAY LEAD TO BACTERIAL RESISTANCE

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The International Society of Peritoneal Dialysis (ISPD) recommendations for exit site care state that "As a maneuver to prevent exit site infections, application of mupirocin to the exit site as part of daily routine is advocated"<sup>1</sup>. If a positive culture is obtained from the nares, there is a risk factor for *S. aureus* infection. In this case, the recommended treatment is intra-nasal mupirocin twice per day for 5 days, which is repeated monthly or when the nose culture becomes positive again. Mupirocin is applied to the exit site as part of routine daily care or alternatively, cyclical oral rifampin, 600 mg QD for 5 days every 12 weeks<sup>1</sup>. However, note that mupirocin should not be used with polyurethane catheters (i.e. Cruz catheter)<sup>1-3</sup>. Mupirocin contains alcohol as an inactive ingredient, which can degrade the catheter and cause it to crack.

Based on these recommendations and many other published studies, it has become the common practice of many clinicians to apply mupirocin to the exit site as part of daily exit-site care<sup>4-7</sup>. The rationale is that mupirocin appears to be safe and effective and that its use can significantly reduce morbidity and potentially reduce mortality, catheter loss or transfer out of PD<sup>6</sup>.

However, there is an increasing body of literature pointing to the emergence of *S. aureus* resistance<sup>8-15</sup>. The literature suggests that both the number of courses and continuous therapy with

mupirocin in PD patients have been identified as independent predictors of resistance<sup>10</sup>. In fact, resistance may be building for other bacteria as well. A recent study evaluated the effects of mupirocin applied once weekly to the catheter exit on *S. aureus* and *coagulase-negative* Staph (CNS) colonization and the development of resistance to these bacteria to methicillin and mupirocin<sup>15</sup>. The authors found that the resistance to mupirocin (MuR) in all isolates was 66% and to methicillin (MeR) 38.8%. As this study shows, attention to resistance should be paid to both *S. aureus* and CNS when studying the effects of mupirocin. Additionally, the rates of mupirocin resistance were comparable whether mupirocin was used once or thrice-weekly. The reporting of significant increases in mupirocin resistance resulting in an increased incidence of *S. aureus* infection, is raising concern about the use of this type of prophylaxis. Concerns for high MuR and MeR in CNS are controversial.

*Editorial note: At the time of submission of this article, the 1998 guidelines were the most current recommendations available. In a recent communication with Dr. Sarah Prichard, President of the ISPD, she reported that new recommendations will be released soon (personal communication, May 3, 2004).*

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and concerns. All of the multidisciplinary participants, particularly experienced patients, are present to discuss any queries. A tour of the PD and/or haemodialysis units are an option on this night.

**Class 4: Transplant Awareness.** Although transplant may not be an option to all patients, it is still the patient's right to receive adequate information. Live related organ donation may be an alternative for some patients and could even result in preemptive transplantation without requiring dialysis.

The information should be delivered in a variety of formats. Some people do not have a good comprehension of the written word, some people cannot read or write, some people learn better from visual aids and some need to take the information away and absorb it slowly. Videos are a good educational tool. A take home package of information is essential. This should include material in a language understandable by the patient and their family, phone numbers of the social worker, nurse and the outpatient department, a timetable of the program and a contact name and number of the local patient support group. Educational programs are often based on what health care professionals think patients should know rather than on what patients and families consider they need<sup>3</sup>. Beware of staff bias – try to have a good cross-section of representatives in your forum. The availability of treatment, financial considerations and staff resources may influence the nephrologist's decision on treatment modalities<sup>7</sup>.

Kidney failure itself, along with commencing dialysis can have a monumental psychological impact on patients and their families. Clinicians have a responsibility to be patient advocates. Fear of the unknown is the most common concern expressed by new patients<sup>8</sup>. Patients can be non-compliant with fluid and diet restrictions, attendance at dialysis sessions and acceptance of their disease when they feel loss of control. The patient may have been the family's main source of income and is now faced with a chronic illness that threatens the financial integrity of the family. Understanding the patient's sense of loss of control is important when addressing their psychological needs. Emotional support should also be extended to the caregivers within the family. They also feel a loss of control and have to adjust to the chronic nature of dialysis. This forced role of caregiver weighs heavily on the partner who is often the last one to receive support and counseling.

There is little question that optimal pre-ESRD care involves early intervention<sup>9</sup>, which may include creation of the access, management of the disease process by a nephrologist and patient education. A study conducted by Jungers et al.<sup>10</sup> showed that chronic renal failure patients referred at a late stage were more likely to have lower calcium levels, higher phosphate levels, anemia, hypertension and fluid overload.

A comprehensive multidisciplinary approach is essential. A single session will not necessarily reduce the need for urgent hospitalization when compared to standard outpatient nephrology care<sup>11</sup>. Repeated explanation and follow-up education are necessary. Since many pre-ESRD patients are often referred too late to a nephrologist, we

should focus our attention on providing education to the general practitioner and the lay public.

In summary, educated patients receive better care, enjoy better clinical outcomes, cope better with the stresses of renal replacement therapy and may become valuable members of the treatment team. The pre-dialysis experience is a journey whose success requires adequate time to assimilate and adjust to changes and is aided by a constructive perspective. The journey from diagnosis to treatment becomes less threatening when they are provided with education, support and the freedom to choose<sup>12</sup>.



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*January 19-21, 2005* 7th International Conference on Dialysis – Advances in ESRD 2005. New Orleans, Louisiana. Contact: Renal Research Institute, Telephone: 212-360-4900; Fax: 212-360-7233; Email: [conference@rriny.com](mailto:conference@rriny.com) or visit their website at <http://www.renalresearch.com>

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*February 28-March 2, 2005* 25th Annual Dialysis Conference. Tampa, Florida USA. Contact: E-mail: [dialysis@health.missouri.edu](mailto:dialysis@health.missouri.edu); or visit their website at <http://www.muhealth.org/~dialysis/index.shtml>

*April 18-21, 2005* American Nephrology Nurses Association (ANNA) 36th National Symposium. Las Vegas, Nevada. Contact: ANNA National Office, East Holly Avenue Box 56, Pitman, NJ 08071-0056; Phone (856) 256-2320; Fax (856) 589-7463; e-mail [anna@ajj.com](mailto:anna@ajj.com). <http://www.annanurse.org>.

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