Improved Long-Term Survival of Dialysis Patients after Near-Total Parathyroidectomy

Jyotirmay Sharma, MD, FACS, Paolo Raggi, MD, Nancy Kutner, PhD, James Bailey, MD, Rebecca Zhang, MS, Yijian Huang, PhD, Charles A Herzog, MD, Collin Weber, MD, FACS

BACKGROUND: Severe secondary hyperparathyroidism, which is associated with life-threatening complications, can develop in dialysis-dependent end-stage renal disease patients. The aim of this study was to compare short- and long-term mortality in dialysis patients who underwent near-total parathyroidectomy (NTPTX) and matched nonoperated controls.

STUDY DESIGN: We identified 150 dialysis patients who underwent NTPTX (1993−2009) at our institution and compared them with 1,044 nonoperated control patients identified in the US Renal Data System registry, matched for age, sex, race, diabetes as cause of kidney failure, years on dialysis, and dialysis modality. Survival outcomes were estimated using multivariable Cox proportional hazards models with stratification on the matching sets, adjusted for cardiovascular comorbidities, smoking, inability to ambulate/transfer, and payor status.

RESULTS: During a follow-up of a mean of 3.6 years (range 0.1 month to 16.4 years), NTPTX patients had a significant reduction in the long-term risk of all-cause death (hazard ratio = 0.68; 95% CI, 0.52−0.89; p = 0.006) compared with controls. Thirty-day mortality rates for NTPTX patients and controls were 246 vs 105 per 1,000 person-years (p = 0.21). In adjusted analyses, NTPTX patients had a 37% reduced risk of all-cause death and a 33% reduced risk of cardiovascular death compared with controls. A durable reduction in mean parathyroid hormone was observed after NTPTX; from 1,776 ± 1,416.6 pg/mL to 301 ± 285.7 pg/mL (p < 0.0001).

CONCLUSIONS: In our center, NTPTX in dialysis patients was associated with a significant reduction in long-term risk of death compared with matched control patients, without a significantly increased short-term risk. (J Am Coll Surg 2012;214:400–408. © 2012 by the American College of Surgeons)

Secondary hyperparathyroidism (sHPT) is a known complication of advanced chronic kidney disease (CKD) and has been linked to increased mortality in dialysis populations.[1] In its extreme forms, this disease can cause severe bone fragility and uremic arteriolopathy (previously known as calciphylaxis).[2,3] The traditional approach to treatment of sHPT has included the use of binders to reduce serum phosphate concentration, vitamin D, and its analogs, and, more recently, calcimimetics. Despite the use of the best available medical therapies, sHPT can require surgical intervention to reduce serum parathyroid hormone (PTH) concentrations and limit end-organ damage to the bone and vasculature. The rate of parathyroidectomy (PTX) declined in the United States in the 10 years between 1988 and 1998, but increased after 1998, despite the availability of expanded medical therapies.[4] Earlier survival analyses indicated an initial increase in mortality in dialysis patients (CKD stage 5D) after PTX, followed by a later recovery and improved survival compared with matched medically treated patients.[4-6]

At our institution, we have performed near-total parathyroidectomy (NTPTX), a variant of subtotal PTX, in the surgical treatment of dialysis patients for nearly 2 decades; accordingly we investigated the short-term and long-term survival of our patients after NTPTX. We identified comparable patients from the US Renal Data System (USRDS) database matched for age, sex, race, diabetes as the primary cause of end-stage renal disease diagnosis, dialysis vintage, starting date of dialysis, and dialysis treatment modality

Disclosure Information: Nothing to disclose.
Supported by The Emory University Parathyroid Surgery Research Fund and National Institutes of Health contract HHSN267200715004C, ADB No. N01-DK-7-5004.

The interpretation and reporting of the data presented here are the responsibility of the authors. This article represents the personal viewpoint of the authors and cannot be construed as a statement of official US Government policy.

Presented at the Southern Surgical Association, 123rd Annual Meeting, Hot Springs, VA, December 2011.

Received December 16, 2011; Accepted December 20, 2011.

From the Departments of Surgery (Sharma, Weber), Internal Medicine-Cardiology (Raggi), Internal Medicine-Nephrology (Bailey), and the US Renal Data System Rehabilitation/Quality of Life Special Studies Center (Kutner, Zhang, Huang), Emory University, Atlanta, GA, and the US Renal Data System Cardiovascular Special Studies Center, Minneapolis, MN (Herzog).
Correspondence address: Jyotirmay Sharma, MD, Department of Surgery, Emory University School of Medicine, 1365 Clifton Rd, NE, Suite 3335, Atlanta, GA 30322. email: jsharm3@emory.edu

ISSN 1072-7515/12/$36.00
doi:10.1016/j.jamcollsurg.2011.12.046

Abbreviations and Acronyms

CKD = chronic kidney disease
NTPTX = near-total parathyroidectomy
PTH = parathyroid hormone
PTX = parathyroidectomy
SAF = Standard Analysis File
sHPT = secondary hyperparathyroidism
USRDS = US Renal Data System

(hemodialysis and peritoneal dialysis) at the time of NTPTX. Our goal was to compare all-cause and cardiovascular mortality in patients who underwent NTPTX in a single referral center with that of CKD-stage 5D patients with similar characteristics who were receiving dialysis at multiple centers around the country and had no record of PTX.

METHODS

Patient selection

This study was approved by the Institutional Review Board of Emory University. Emory University is a tertiary referral center and patients are referred from multiple outlying hospitals and clinics. The database of secondary hyperparathyroidism patients operated at Emory University between 1993 and 2009 includes 218 patients whose records were found in the USRDS. Of these, 50 were excluded because they had undergone renal transplantation, 2 had no record of modality of dialysis, and 16 patients were excluded because of a history of PTX. Patients submitted to NTPTX at our institution were included in this study if no record of PTX before NTPTX was found for the patient from the USRDS Hospitalization Standard Analysis Files (SAFs) since the start of dialysis and patients were undergoing either hemodialysis or peritoneal dialysis at the time of their NTPTX. The USRDS Hospitalization SAF includes PTX procedures covered by Medicare.

For each NTPTX patient, controls were individually matched for age (±2 years), sex, race, diabetes as cause of end-stage renal disease, dialysis duration (vintage), year they started dialysis (±1 year), and dialysis modality (hemo- vs peritoneal dialysis). On the potential NTPTX date, matched controls were required to be alive, have no record of PTX from the USRDS Hospitalization SAFs since dialysis start, and receive the same dialysis modality (hemodialysis or peritoneal dialysis) as the NTPTX patient. The potential NTPTX date for a control was defined as the patient's dialysis start date plus the same time interval that lapsed between dialysis start date and surgery date for the patient in question. For example, for a patient who started dialysis on January 1, 2006 and underwent NTPTX on February 1, 2006, an acceptable control could have started dialysis on July 1, 2006 and his potential NTPTX date was then assumed to be August 1, 2006. Review of the USRDS registry for patients with these preselected matching characteristics yielded a maximum number of 7 nonoperated controls per each operated patient. The target number of 7 matched controls for each NTPTX patient was obtained for 148 patients. For 1 patient the match was 1:5 controls and for 1 patient the match was 1:3 controls. The total number of controls was therefore 1,044. One NTPTX patient and its multiple controls constituted a matching set.

For dialysis patients who underwent NTPTX, the USRDS Coordinating Center deidentified the data by assigning unique USRDS patient identifiers. Data for individual NTPTX patients were then linked at the USRDS Special Studies Center at Emory with information available in the USRDS SAFs 2010.

Patient demographic characteristics (ie, age, sex, and race), clinical characteristics, and dialysis start date were obtained from the 2010 USRDS SAFs. Intravenous vitamin D use was determined in 1998−2008 Medicare Part A outpatient claims files, using Healthcare Common Procedure Coding System codes J0635 and J0636 for calcitriol, J2500 and J2501 for paricalcitol, and J1270 for doxercalciferol. PTX procedure dates were identified by ICD-9-CM surgical procedure code 06.81 (total PTX) or 06.89 (other PTX). Mortality data were available through September 30, 2009. Cardiovascular causes of death were acute myocardial infarction, pericarditis, atherosclerotic heart disease, cardiomyopathy, cardiac arrhythmia, cardiac arrest, valvular heart disease, pulmonary edema, congestive heart failure, pulmonary embolus, cerebrovascular accident, ischemic brain damage/anoxic encephalopathy, nongastrointestinal hemorrhage, and mesenteric infarction/ischemic bowel, determined by Centers for Medicare and Medicaid Services form CMS-2746 cause of death codes 23, 25–32, and 35–44.

NTPTX technique

The procedure of choice at our institution, NTPTX, is a variant of a subtotal PTX; during NTPTX a vascularized remnant of 1 parathyroid gland, which approximates the size of 2 normal parathyroid glands, is left in situ.[7] All patients undergo bilateral neck exploration and all parathyroid glands are identified before resection. The viability of the remnant is ensured before resection of the other enlarged parathyroid glands, and the remnant is functional immediately after surgery. Size determination of the parathyroid gland remnant is done intraoperatively to confirm that the parathyroid remnant is no larger than 2 normal parathyroid glands (80 to 100 mg).[8] Intraoperative PTH levels are obtained before and after resection of each enlarged parathyroid gland with the goal to attain a final intraoperative PTH ≈100 pg/mL.[8] (Fig. 1).