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Inside This Issue

The Role for Minimally Invasive Parathyroidectomy

Primary hyperparathyroidism (HPT) is the most common cause of hypercalcemia, affecting as many as 1 per 1,000 women over the age of 60 years. Clive S. Grant, MD, of the Department of Surgery at Mayo Clinic in Rochester, says: "For many years, standard bilateral cervical exploration was the gold standard, with a cure rate higher than 98% and risk of recurrent laryngeal nerve damage or hypoparathyroidism of less than 1%. With the introduction of several key advances, this highly successful operation has been further refined with patient-focused improvements that have prompted a shift from the standard open surgical approach to minimally invasive techniques."

Open minimally invasive parathyroidectomy (MIP) has emerged as a popular method in endocrine surgery (Figures 1-4). Key advances that have facilitated the development of MIP are 3-fold:

- High-quality parathyroid adenoma localization techniques
- Highly accurate rapid intraoperative parathyroid hormone (PTH) monitoring
- Small-incision outpatient procedure

High-Quality Localization Techniques

Since the 1990 National Institutes of Health Consensus Development Conference on Diagnosis and Management of Asymptomatic Primary Hyperparathyroidism (http://consensus.nih.gov/1990/1990AsymptomaticHyperparathyroidisim082html.htm), considerable improvements in and widespread use of technetium-sestamibi (MIBI) scanning have facilitated a "focused" approach to localizing parathyroid adenomas. Dr Grant explains: "Throughout the 1990s, preoperative localization was used in at least 75% of patients. With or without a thyroid subtraction scan, often with the addition of single photon emission computed tomography imaging and oblique views, MIBI scanning has become the localization procedure of choice. It is minimally invasive and depends on physiologic hyperfunction of the enlarged parathyroid gland rather than on purely anatomic identification. Adenomas anywhere in the neck or mediastinum can be localized. MIBI scanning is somewhat less dependent than cervical ultrasonography on the size of the parathyroid adenoma for imaging, but the cost is usually higher. A major advantage of MIBI scanning over ultrasonography is that it is less dependent on operator experience to obtain a high-quality scan. The sensitivity of MIBI scanning is 75% to 88%."

Clive S. Grant, MD

Another localization option is high-resolution, real-time small parts ultrasonography, with sensitivity and specificity of approximately 70% and 90%, respectively. It is noninvasive and the most inexpensive preoperative localization technique. It is anatomically precise and capable of identifying 95% of adenomas weighing more than 1,000 mg. However, ultrasonography identifies less than 50% of adenomas weighing less than 200 mg. The key limiting factor for ultrasonographic localization is its extreme dependence on the operator.

Highly Accurate, Rapid Intraoperative PTH Measurement

In contrast to a turnaround time of 2 weeks for parathormone determination 25 years ago, intraoperative PTH monitoring has a turnaround time of only 20 minutes or less. The accuracy of intraoperative PTH measurement has been widely verified and enthusiastically supported. Nevertheless, because the cost ranges from $500 to $1,000 per patient, it is not widely available.

Small-Incision Outpatient Procedure

The option of local anesthesia, a small incision, and brief outpatient recovery time are further advantages of the unilateral MIP approach.

The Mayo Clinic Experience

Dr Grant explains: "In June 1998, we gradually

Figures 1-4. Open Minimally Invasive Parathyroidectomy

Figure 1. The small, 3-cm incision site is locally anesthetized.

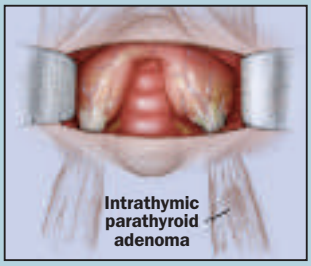

Figure 2. Through this small incision, the lower poles of each thyroid lobe are seen.

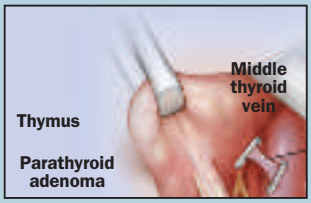

Figure 3. The lower pole of the left thyroid lobe is elevated, and a small venous branch is clipped and cut. The parathyroid adenoma is seen, somewhat hidden in the portion of the thymus attached to the thyroid.

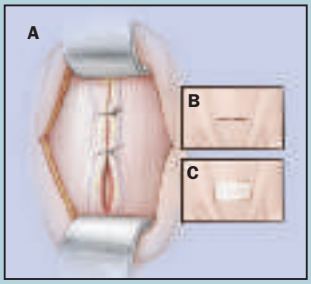

Figure 4. After the parathyroid adenoma has been removed, the incision is closed by suturing the muscles (A) and skin (B), and a small bandage is applied (C).

introduced MIP at Mayo Clinic. Through December 2006, we performed 2,358 parathyroid operations. Excluding reoperative parathyroid surgery, the total of 2,077 parathyroid operations included 1,062 MIPs (51%), 942 conventional procedures (45%), and 73 procedures (4%) that were converted from MIP to conventional operations. During the past 2 years, 65% of patients were operated by the MIP procedure, and 97% of patients who required a standard conventional procedure had specific contraindications for the MIP procedure. The cure rate for both conventional open exploration and MIP was 97%. Localization was performed with MIBI scanning (2,052 patients) and ultrasonography (763 patients). The sensitivity and positive predictive value of MIBI were 86% and 92%, respectively; comparable figures for ultrasonography were 62% and 90%. Important to these figures is the median weight of the largest resected parathyroid gland of 430 mg and a mean calcium value of 10.9 mg/dL (normal, 8.9-10.1 mg/dL).

"Of the patients undergoing MIP, 627 (59%) received general anesthesia, and 435 (41%) had a combination of local anesthesia and intravenous sedation. Correspondingly, 579 patients (55%) were dismissed from the hospital as outpatients, whereas 483 (45%) were hospitalized. At present, patients operated with either anesthetic technique are typically dismissed as outpatients. Intraoperative PTH monitoring was used in 1,598 patients, with sensitivity, positive predictive value, and accuracy of 98%, 99%, and 97%, respectively. The true-negative rate, defined as no decline in the PTH value when the patient still had an additional enlarged parathyroid gland, was 8% in this series."

Perhaps one of the most important advances in primary HPT is the understanding of its relationship with bone disease. It is clear that a large percentage of patients with osteoporosis and osteopenia derive benefit from surgery, as judged by improvement in bone mineral density after surgical cure of the disease. Dr Grant notes: "Of 1,707 patients operated at Mayo Clinic with known bone mineral density measurements, preoperatively only 376 (22%) were normal, whereas 721 (42%) had osteopenia and 610 (36%) had osteoporosis."

The successful outcome of parathyroid surgery, specifically MIP, depends on a highly skilled and experienced multidisciplinary team. The endocrinologist, nuclear medicine specialist and ultrasonographer, clinical laboratory and intraoperative PTH technicians, and surgeon as well as the nursing and paramedical staff all must function together smoothly and efficiently to achieve consistently successful outcomes.

When to Consider Vertebroplasty

Vertebroplasty is a minimally invasive procedure in which medical cement is placed through a small needle into painful vertebral fractures. Initially developed in France in the 1980s for treatment of tumors of the spine, its application in North America has predominantly been in osteoporotic fractures. Currently, vertebroplasty is applied nearly exclusively as a palliative procedure to relieve pain in patients with a compression fracture in whom pain persists beyond the usual 4 to 6 weeks. Symptoms suggesting cord compression should discourage consideration of vertebroplasty, since unintended deposition of cement into the spinal canal might worsen the degree of cord compromise. Radicular symptoms and back pain lasting more than 1 to 2 years are relative contraindications; however, some patients may gain relief. Some practitioners believe that localized tenderness to palpation over the spinous process of the fractured vertebra is an important physical examination finding, but no study has confirmed this point of view.

Ann E. Kearns, MD, PhD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, explains: "Imaging is the cornerstone of patient selection. Plain radiographs should always be performed to determine the presence and number of vertebral compression fractures. If the fracture is determined to be new on the basis of serial radiographs, it is probably reasonable to proceed with vertebroplasty based solely on plain radiographs. However, most centers rely heavily on magnetic resonance imaging (MRI) to select patients for vertebroplasty. MRI is useful to identify those fractures with bone marrow edema for treatment, to exclude malignancy as a cause of the fracture, and to assess for compromise of the spinal cord

David F. Kallmes, MD, and Ann E. Kearns, MD, PhD

or canal. Notwithstanding the widespread assumption that edema diagnosed on MRI is a sine qua non of a pain-generating fracture, there is no compelling evidence to support this idea. Indeed, some investigators report excellent pain relief with vertebroplasty in fractures without edema. In questionable cases of malignancy, a bone biopsy can be performed with vertebroplasty immediately following, since it is thought that the cement may be toxic to underlying tumor."

If MRI is contraindicated, elevated radiotracer uptake in a fracture by bone scintigraphy can predict a good outcome after vertebroplasty. However, accurate localization of the exact vertebral level of increased tracer uptake may be challenging in kyphotic patients with multiple fractures. Computed tomographic (CT) imaging is typically reserved for patients with suspected bony retropulsion or for fractures that appear on other imaging to involve the posterior vertebral wall. In these cases, special care should be taken to avoid any dorsal extravasation of cement. In addition to the appropriate history and imaging, patients must also be free of infection (the treated vertebra is at risk for severe infection from bacterial seeding), be without bleeding diathesis, and be physically able to lie prone.

David F. Kallmes, MD, of the Department of Radiology at Mayo Clinic in Rochester, says: "The majority of vertebroplasty procedures are performed on an outpatient basis with the patient under moderate sedation. Patients ideally are treated in a fluoroscopy suite with high-quality imaging because accurate deposition of cement requires exquisite visualization. The cement used in the procedure is polymethylmethacrylate (PMMA), the same medical cement that has been used for decades in orthopedic applications. Barium is added to the PMMA to allow visualization, because PMMA itself is lucent on fluoroscopy. An 11-gauge needle is placed either through or next to the pedicle into the anterior portion of the vertebral body (Figure). The cement is slowly infused into the vertebral body under constant fluoroscopic guidance (Figure). The infusion is stopped when cement reaches the posterior portion of the vertebral body, extravasates through the endplate into the intervertebral disk, or exits the lateral vertebral body through a vein. There is no specific filling criterion—either on a volume basis or percent filling basis—that predicts a good outcome. Indeed, sub-milliliter cement volumes, especially in the mid and upper thoracic spine, may lead to a good outcome. Substantial, often immediate, pain relief can be expected in 70% to 80% of patients in most case series. There is no specific imaging follow-up required after vertebroplasty."

Dr Kallmes cautions: "Even though vertebroplasty appears to be highly efficacious in alleviating pain associated with osteoporotic compression fractures, a number of controversies persist: the relative merits of standard vertebroplasty versus balloon-assisted vertebroplasty (kyphoplasty); the risk of new fractures after vertebroplasty compared with such risk without vertebroplasty; the availability of optimal biomaterial for the procedure; the prophylactic implementation of vertebroplasty; the ideal timing for implementation of vertebroplasty in relation to duration of fracture pain; the ideal volume of cement required for pain relief; and a dearth of Level 1 evidence for the efficacy of the procedure."

All patients undergoing vertebroplasty benefit from evaluation by an osteoporosis expert—even if osteoporosis is not a new diagnosis. This evaluation includes assessment for secondary causes of osteoporosis, determination of efficacy of the patient's current osteoporosis medication or selection of a new treatment, and instruction in safe moving practices and fall prevention. This team approach treats the current pain and optimizes reduction in risk of future fractures.

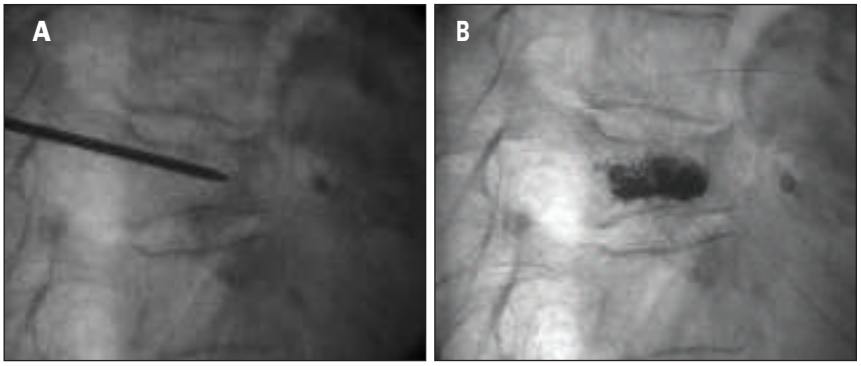

Figure. A, Lateral plain radiograph showing T7 compression fracture with a vertebroplasty needle placed via a transpedicular approach. B, Lateral plain radiograph after vertebroplasty, showing barium-opacified cement within the T7 fracture.

Clinical Trials for Advanced Thyroid Cancer

Thyroid cancer is one of the most effectively treated malignancies—patients typically present with disease localized to the thyroid bed that is cured or contained indefinitely with surgery combined with radioiodine (^{131}I) thyroid remnant ablation where indicated. However, a small fraction (<10%) of thyroid cancer patients either present with advanced disease or later have a recurrence after primary therapy. Advanced disease in this context is defined as the presence of distant metastasis (not including cervical lymph node metastasis) or recurrent locally invasive disease in the neck. By the most recent American Joint Committee on Cancer classification, this definition includes stage IV disease as well as stage II disease (distant metastases) in patients less than 45 years old. Any occurrence of anaplastic thyroid cancer is also considered advanced cancer because of its extremely poor prognosis even after aggressive resection.

John C. Morris III, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, explains: "Although therapy for the majority of patients with low-risk thyroid cancer is quite effective—these patients have an overall excellent prognosis—patients with advanced thyroid cancer have very limited options for effective disease control. Notwithstanding that ^{131}I therapy is the mainstay of initial therapy for advanced differentiated thyroid cancer, the metastatic disease in many of these patients is unresponsive, either primarily or secondarily, to ^{131}I treatment. Other modalities such as aggressive surgery, external beam radiotherapy, and Gamma Knife radiosurgery may be useful in selected patients, especially with respect to symptom palliation. However, none of these approaches, except for complete surgical removal, has curative potential for radioiodine-resistant tumors, and their impact in improving survival remains to be demonstrated. Conventional chemotherapeutic agents have shown little or no substantive activity in differentiated thyroid cancer, with reports of only partial responses, 20% or less, and rare complete responses."

John C. Morris III, MD, and Keith C. Bible, MD, PhD

Robert C. Smallridge, MD

Robert C. Smallridge, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Jacksonville, says: "Over the past decade, extensive research directed at defining the genetic and signaling pathway defects in many cancer types, including thyroid cancer, has improved our understanding of the pathogenesis of these malignancies. This information also has made possible the design and development of agents that specifically act on these defects and pathways." In particular, potential targets for therapy in differentiated thyroid cancer include the tyrosine kinases as well as growth factor receptors, heat shock proteins (HSPs), and angiogenesis pathways (Figure). Several targeted agents are being used clinically in phase 1, 2, and 3 clinical trials. Although most of the drugs were developed initially for other tumor types, many of these trials may include or, in some cases, are specifically written for thyroid cancer patients. Dr

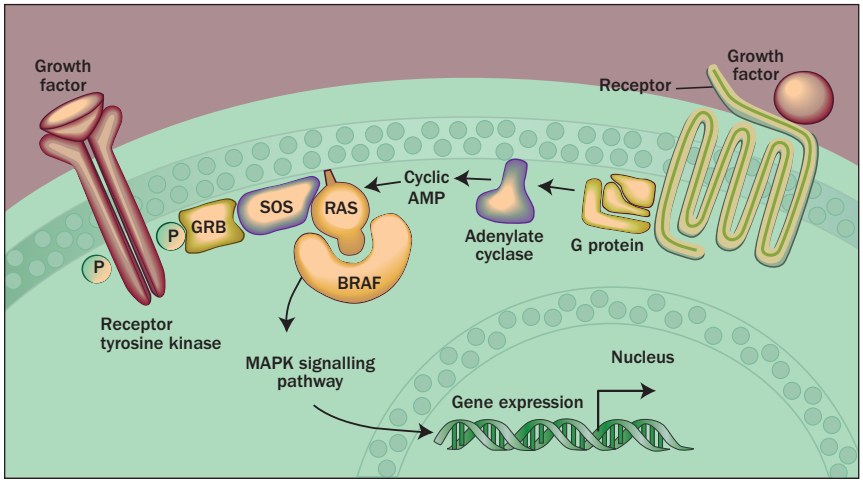

Figure. Extracellular signals (eg, growth factors) control cell proliferation or differentiation by activating either tyrosine kinase or G protein–coupled receptors. Changes in gene expression occur via the signalling pathway shown in this figure. Each step in this pathway is a potential target for chemotherapeutic agent development. Abbreviations: AMP, adenosine monophosphate; BRAF, v-raf murine sarcoma viral oncogene homolog B1; G protein, guanine nucleotide binding proteins; GRB, growth factor–binding protein; P, phosphate; MAPK, mitogen-activated protein kinase; RAS, RAS oncogene; SOS, son of sevenless protein.

Smallridge considers this advance in thyroid cancer treatment "perhaps the most exciting event in the management of thyroid cancer since the beginning of ^{131}I therapy in the 1950s."

The Divisions of Endocrinology and Departments of Medical Oncology at Mayo Clinic in Rochester and in Jacksonville are participating in and developing clinical trials of these newer targeted therapies. Keith C. Bible, MD, PhD, of the Department of Medical Oncology at Mayo Clinic in Rochester, says: "Currently 2 trials are enrolling patients with advanced papillary, follicular, and medullary thyroid cancers at Mayo Clinic. An HSP90 inhibitor (tanespimycin; 17-allylamino-17-demethoxygeldanamycin [17-AAG]), which is administered intravenously, is being examined in a phase 2 trial for cancers of all 3 cell types and was the first trial open at Mayo Clinic for thyroid cancer. More recently, a second phase 2 trial of the orally available multikinase inhibitor vandetanib was opened for medullary thyroid cancer. More clinical trials with novel agents are currently being developed. To date, little information regarding efficacy of any of these newer agents is available because of the limited time the trials have been open, but within 1 to 3 years, much more will be known about the activities of these agents in thyroid cancers."

Table. Current Open Clinical Trials for Patients With Thyroid Cancer*

Drug/Agent	Disease	Target	Primary Site
Tanespimycin (17-AAG)	DTC	HSP90	Mayo Clinic Rochester and Mayo Clinic Jacksonville
Decitabine	DTC	DNA methylation	MD Anderson Cancer Center
Bortezomib	DTC	Ubiquitin-proteasome pathway	MD Anderson Cancer Center
Romidepsin	DTC	Histone deacetylase	Memorial Sloan-Kettering Cancer Center
Rosiglitazone	DTC	PPARγ	University of California San Francisco
Irinotecan	MTC	Topoisomerase	Johns Hopkins University
Sunitinib	DTC/MTC	Multikinases	University of Chicago
Combretastatin	ATC	Angiogenesis	Case Western Reserve University
Sorafenib	ATC	Multikinases (RAF-kinase)	Case Western Reserve University
Sorafenib	MTC	Multikinases (RAF-kinase)	Ohio State University
Lenalidomide	DTC	Immunomodulatory/angiogenesis	University of Kentucky
Imatinib	ATC	Multikinases	University of Michigan
Axitinib	DTC	VEGFR inhibitor	Multicenter trial
Vandetanib	MTC	RET proto-oncogene	Multicenter international trial (including Mayo Clinic Rochester and Mayo Clinic Jacksonville)

*This list was up-to-date as of June 1, 2007. Most of these trials are recruiting at multiple sites, but only the primary site is listed. For more information, go to www.thyroidtrials.org or www.cancer.gov/search/clinical_trials.

Abbreviations: ATC, advanced thyroid cancer; DNA, deoxyribonucleic acid; DTC, differentiated thyroid cancer; HSP90, heat shock protein 90; MTC, medullary thyroid cancer; PPAR, peroxisome proliferator-activated receptor; VEGFR, vascular endothelial growth factor receptor.

Dr Morris explains: "Because of minimal antitumor activity, we generally do not recommend conventional chemotherapy in advanced thyroid cancer, with the exception of anaplastic thyroid cancer. Patients with advanced thyroid cancer should consider entering one of the currently available or soon-to-be-opened clinical trials. Investigators pursuing these trials are well distributed throughout the country, including at Mayo Clinic, and these trials should be accessible to many patients (Table). Clinical trials are inclusive of patients with all histologies of thyroid cancer, including anaplastic. Also, several of the agents in these new clinical trials are orally administered, making the logistics of patient participation from longer distances more manageable."

More information about these trials is available on the American Thyroid Association's clinical trials Web site (www.thyroidtrials.org) and the National Cancer Institute clinical trials Web site (www.cancer.gov/search/clinical_trials).

Vitamin and Mineral Supplementation: Who Should Take What?

The majority of adults in the United States report taking some type of dietary supplement. For most, it is not for the treatment of a specific nutritional deficiency, but rather for disease prevention. Yet, there is a lack of high-quality data supporting such a role.

Multivitamin and Mineral Preparations

Vitamins are organic compounds that are essential in small amounts for normal metabolism. Most vitamins cannot be synthesized by humans and need to be ingested in the diet to prevent disorders of metabolism. Daily Values (DVs) for vitamin requirements have been established by the National Academy of Sciences and National Health Council as the amount necessary to prevent overt deficiency syndromes. Maria L. Collazo-Clavell, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, explains: "The DV chosen is generally set at 2 standard deviations above the estimated average daily requirement for healthy individuals in a particular age and sex group. Thus, consumption of the DV for vitamins exceeds the needs of the majority of the population. However, the DVs may not be adequate to prevent chronic disease in some populations. For example, ingesting 400 international units (IU) of vitamin D per day (the amount of vitamin D in most multivitamin preparations) may not be sufficient to prevent bone loss in women as they age."

Most multivitamin and mineral preparations provide the recommended DVs. Many preparations are marketed to specific populations by tailoring their composition beyond DV requirements and proposing to be a superior product for disease prevention. Kurt A. Kennel, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, notes: "Data regarding the benefits in disease prevention of multivitamin and mineral preparations that meet the recommended DVs is limited, of poor quality, and consequently often inconclusive. Even positive studies do not support universal supplementation—they show small effects that are hard to generalize." Much of the data were recently summarized at the National Institutes of Health State-of-the-Science Conference on Multivitamin/Mineral Supplements and Chronic Disease Prevention (http://consensus.nih.gov/2006/2006MultivitaminMineralSOS028main.htm).

Table. Vitamin and Mineral Supplements With Proven Benefit in Specific Circumstances

Folic acid for prevention of neural tube defects

- Women in reproductive years: 400 μg per day
- Pregnancy
  - Routine: 800 μg per day
  - High risk: 4,000 μg per day

Vitamin B_{12}

- >50 years old: 2.4 μg per day
- Decreased gastric acid secretion: 2.4 μg per day
- Vegan diet: 2.4 μg per day

Vitamin D for optimal bone health

- Older adults: ≥800 IU per day

Antioxidant vitamins (eg, vitamin A, beta carotene, vitamin E, vitamin C)

- Not recommended

Calcium (requirement depends on age and clinical situation)

- Most adults: 1,000 to 1,300 mg per day
- Bone loss: 1,000 to 1,500 mg per day

Folic Acid

Folic acid is present in green, leafy vegetables, fruits, cereals, and nuts, among other foods. Folic acid included in vitamin supplements is often a more bioavailable form. The DV for folic acid is 400 μg daily. Although folic acid supplementation has not proved beneficial for some indications (eg, cardiovascular disease prevention), it may have a role in selected patients.

Pregnancy and Neural Tube Defects

Several studies have confirmed the benefits of folic acid supplementation during pregnancy for the prevention of neural tube defects. Although the standard DV of 400 μg daily has been recognized to significantly reduce the risk for neural tube defects, larger doses (eg, 4,000 μg per day) may offer greater protection, particularly in high-risk women (eg, those with a child born with a neural tube defect).

Cancer Prevention

Higher folic acid intake has been reported to lower the risk for colon cancer. Most studies are observational in nature (eg, the Nurses' Health Study and the Health Professionals Follow-up Study) and evaluate the amount of folic acid present in a multivitamin preparation (400 μg per day). Folic acid supplementation has been reported to mitigate some of the increased risk of colon cancer associated with regular alcohol ingestion. In another study, folic acid supplementation (400 μg per day) was associated with a lower risk for breast cancer, especially among women who drank alcohol regularly.

Vitamin D

"The current DV for vitamin D is 400 IU per day. However, there is much debate as to the appropriateness of this recommendation. Subclinical vitamin D deficiency is being increasingly recognized, even in persons taking 400 IU daily in the form of a multivitamin (see *Endocrinology Update*, volume 1, number 2 at http://www.mayoclinic.org/endocrinology-rst/endoupdate.html)," notes Daniel L. Hurley, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester. Hurley adds: "Several studies have shown the benefits of daily vitamin D supplementation (800 IU) in the prevention of bone loss and

Kurt A. Kennel, MD, Maria L. Collazo-Clavell, MD, and Daniel L. Hurley, MD

fractures. Most of the benefit is attributed to treatment of unrecognized vitamin D deficiency. Although toxicity has been a concern, it has not been generally reported in doses lower than 10,000 IU daily, and although consensus is lacking, experts in vitamin D and bone health suggest that a total vitamin D intake between 1,000 and 2,000 IU per day may more likely reflect the ideal DV, rather than 400 IU per day. Observational studies have proposed a cancer preventive effect. However, limited studies have prospectively evaluated the impact of supplementation of vitamin D alone or in adequate doses on cancer incidence."

Antioxidant Vitamins

Antioxidant vitamins (vitamins A, E, and C) have been proposed to lower the risk of cancer and cardiovascular disease. Vitamin A can be found as retinol (in animal products) and carotenoids (in fruits and vegetables). Dr Collazo-Clavell comments: "The recommended DVs for antioxidant vitamins are 600 to 900 μg per day for vitamin A, 75 to 90 mg per day for vitamin C, and 15 mg (22 IU) per day for vitamin E. Clinical trials looking at the impact of antioxidant vitamin supplementation have not consistently shown a protective effect against cancer or cardiovascular disease."

Vitamin B_{12}

The recommended DV for vitamin B_{12} is 2.4 μg per day. It is estimated that routine dietary intake for an adult following an omnivore diet is 5 μg per day. However, vitamin B_{12} deficiency is being recognized increasing, particularly among the elderly, with a reported prevalence of up to 20%. Dr Kennel adds: "The cause of vitamin B_{12} malabsorption of foods containing cobalamin is impaired gastric acid secretion in 60% to 70% of cases. Other causes of vitamin B_{12} deficiency include inadequate dietary intake (especially in those on a vegan diet), malabsorption, and gastric surgery. It has been recommended that individuals older than 50 years (especially those being treated with agents that decrease gastric acid secretion) ensure they meet the recommended DV by supplementation or ingestion of fortified foods."

Calcium

The importance of adequate calcium intake to bone health is well recognized. Dr Hurley says: "For adults, the recommended DV for calcium is generally in the range of 1,000 to 1,300 mg per day and up to 1,500 mg per day in those with bone loss. Several studies have confirmed the benefits of calcium supplementation in the prevention of bone loss, and some studies have shown the risk for fractures is lower. Of interest, calcium is the only instance where supplementation is often advised over dietary modification. There seems to be predictable absorption of currently available calcium supplements without the variability that may be observed with calcium content in nondairy calcium rich foods. Stomach acid is needed for the absorption of calcium carbonate supplements. However, even in patients without gastric acid (eg, achlorhydria), there appears to be enough acid present with meal ingestion to absorb calcium carbonate. Thus, it is likely best that calcium carbonate supplements always are taken with food. Calcium citrate can be absorbed when taken with or without food, but the pill is larger because of a lower proportion of calcium content."

Recommendations

Evidence supporting efficacy in preventing chronic disease is insufficient to recommend routine multivitamin and mineral supplementation in healthy adults, although this form of supplementation is likely safe. Circumstances in which multivitamin and mineral supplementation should be considered are those in which individuals may not be meeting their daily requirements (eg, when actively losing weight).

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Education Opportunities

Please call 800-323-2688 or visit www.mayo.edu/cme/endocrinology.html, unless indicated otherwise, for more information about these courses or to register.

Mayo Clinic Nutrition in Health and Disease, November 8-9, 2007, Hilton San Francisco Financial District, San Francisco, California. This course, designed for physicians, dietitians, nurses, and pharmacists, will provide a full spectrum, in-depth overview of challenging nutritional issues that clinicians encounter in the ambulatory and hospital settings.

11th Mayo Clinic Endocrine Course, April 16-19, 2008, Mallorca, Spain. This course, created for endocrinologists and interested internists and surgeons, will cover selected topics in endocrinology through short lectures, case-based debates, clinicopathologic sessions, and clinical pearls sessions. For more information about this course, please visit http://endocourse.mayo.edu or call 507-284-2776.

Helen Karakelides, MD, Peter J. Tebben, MD, and Matthew T. Drake, MD, PhD

Marius N. Stan, MD

New Staff in Endocrinology at Mayo Clinic in Rochester

Four endocrinologists have joined the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester in 2006 and 2007. They (and their areas of interest) are Helen Karakelides, MD (outpatient nutrition); Peter J. Tebben, MD (pediatric and adult bone and mineral disorders); Matthew T. Drake, MD, PhD (bone and mineral disorders); and Marius N. Stan, MD (thyroid disorders).

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