

# Bilateral Neck Exploration Under Hypnosedation A New Standard of Care in Primary Hyperparathyroidism?

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## Objective

The authors review their experience with initial bilateral neck exploration under local anesthesia and hypnosedation for primary hyperparathyroidism. Efficacy, safety, and cost effectiveness of this new approach are examined.

## Background

Standard bilateral parathyroid exploration under general anesthesia is associated with significant risk, especially in an elderly population. Image-guided unilateral approaches, although theoretically less invasive, expose patients to the potential risk of missing multiple adenomas or asymmetric hyperplasia. Initial bilateral neck exploration under hypnosedation may maximize the strengths of both approaches while minimizing their weaknesses.

## Methods

In a consecutive series of 121 initial cervicotomies for primary hyperparathyroidism performed between 1995 and 1997, 31 patients were selected on the basis of their own request to undergo a conventional bilateral neck exploration under local anesthesia and hypnosedation. Neither preoperative testing of hypnotic susceptibility nor expensive localization studies were done. A hypnotic state (immobility, subjective well-being, and increased pain thresholds) was induced within 10 minutes; restoration of a fully conscious state was obtained within several seconds. Patient comfort and quiet surgical conditions

were ensured by local anesthesia of the collar incision and minimal intravenous sedation titrated throughout surgery. Both peri- and postoperative records were examined to assess the safety and efficacy of this new approach.

## Results

No conversion to general anesthesia was needed. No complications were observed. All the patients were cured with a mean follow-up of  $18 \pm 12$  months. Mean operating time was  $<1$  hour. Four glands were identified in 84% of cases, three glands in 9.7%. Adenomas were found in 26 cases; among these, 6 were ectopic. Hyperplasia, requiring subtotal parathyroidectomy and transcervical thymectomy, was found in five cases (16.1%), all of which had gone undetected by localization studies when requested by the referring physicians. Concomitant thyroid lobectomy was performed in four cases. Patient comfort and recovery and surgical conditions were evaluated on visual analog scales as excellent. Postoperative analgesic consumption was minimal. Mean length of hospital stay was  $1.5 \pm 0.5$  days.

## Conclusions

Initial bilateral neck exploration for primary hyperparathyroidism can be performed safely, efficiently, and cost-effectively under hypnosedation, which may therefore be proposed as a new standard of care.

The main aim of surgery in primary hyperparathyroidism is to maintain normocalcemia after adequate removal of the abnormal parathyroid tissue at the initial operation. The cost and risk of unsuccessful surgery are very significant.<sup>1</sup>

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Therefore, the best surgical approach should result in the highest rate of cure, the lowest complication rate, and minimal financial and socioeconomic consequences. Many procedures have been described to reach these goals, but to date none has been able to maximize all the advantages of a given procedure without avoiding many of the consequent disadvantages. Bilateral neck exploration has been considered as the standard because it avoids missing ectopic, supernumerary, or multiple abnormal glands, without re-

quiring routine expensive preoperative localization.<sup>2-4</sup> Nevertheless, this conventional "four-gland exploration" requires general anesthesia, with its associated risks.

A more selective approach, especially when performed under local anesthesia, is theoretically less invasive but requires costly pre- or intraoperative procedures to localize the abnormal parathyroid tissue and to confirm its removal.<sup>5-9</sup> Moreover, patients are generally selected for a unilateral procedure on the basis of parathyroid imaging. In addition, patients with obvious multiglandular disease or with indications for additional procedures such as removal of thyroid nodules are generally excluded. Therefore, what is currently the best surgical approach for primary hyperparathyroidism? Any such approach must be appropriate for a diverse and nonselected population, provide high patient satisfaction and surgical comfort, and maximize cure rates while minimizing cost and complications. This study was designed to test the hypothesis that parathyroid surgery under hypnosis and minimal conscious intravenous sedation (hypnosedation) could fulfill all these requirements.

## PATIENTS AND METHODS

### Study Population

Since 1992, hypnosis has been employed as adjunct therapy in conscious sedation for plastic surgery at Sart Tilman University Hospital in Liège, Belgium. After a successful experience of >1000 procedures under hypnosedation, we decided in early 1995 to apply hypnosedation in endocrine cervical surgery, particularly that performed for primary hyperparathyroidism.<sup>10-13</sup> All patients seen at our endocrine surgical clinic with primary hyperparathyroidism were given information concerning hypnosis and conscious intravenous sedation and were asked to consider this option as an alternative to general anesthesia. Deafness, severe psychiatric diseases, and allergies to local anesthetics were considered to be contraindications. Informed consent was the first requirement for inclusion. Of the 121 patients who underwent surgery for primary hyperparathyroidism between January 1995 and December 1997, 31 agreed to hypnosedation and were interviewed, examined, and informed by the anesthesiologists in charge of the project (MEF and JJ). No preoperative testing of hypnotic susceptibility was done. Our series included 22 women (mean age 63.6 years [range 25 to 81]) and 9 men (mean age 59.4 years [range 35 to 85]). At the time of surgery, 11 patients were older than 75 years of age; among these, 3 were older than 81 years of age. None of them had had previous neck exploration.

### Preoperative Evaluation

Mean preoperative total calcium and intact parathyroid hormone (PTH) serum levels were respectively  $2.84 \pm 0.25$  mMol/l (range 2.38 to 3.40; normal values 2.15 to 2.55) and

$203 \pm 235$  pg/ml (range 58 to 1096; reference 12 to 65). In 14 patients, hypercalcemia was incidentally discovered by routine biochemical screening. In 17, bone disease (9 cases), fatigue, mental impairment, or psychiatric disturbances (4 cases), nephrolithiasis (3 cases), including 2 cases of normocalcemic hyperparathyroidism, and pancreatitis (1 case) led to the diagnosis of primary hyperparathyroidism. High-resolution ultrasonography (Logiq 400 MD, General Electric, 7.5 MHz 739 L probe) was routinely performed by the three endocrine surgeons (MM, EH, TD) at the time of the first endocrine surgical visit; no additional localization studies were requested. Nevertheless, the majority of the patients had already undergone various localization studies, mostly prescribed by the referring endocrinologists and physicians—sestamibi/technetium-99m scintigraphy in 19 cases, computed tomography in 9 cases, 18-FDG PET scan in 3 cases, and invasive selective venous sampling for PTH in 2 cases.

### Patient Admission

Patients scheduled for surgery in the morning were admitted the day before surgery; those scheduled for surgery in the afternoon were admitted fasting on the morning of the operation. Premedication consisted of 0.5 mg oral alprazolam. Before induction of hypnosedation, intravenous access was established to allow titrated administration of anxiolytics (midazolam) and analgesics (alfentanil). Doses were titrated throughout surgery to maintain conscious sedation, to provide patient comfort, and to facilitate quiet surgical conditions. Blood pressure, heart and respiratory rates, and arterial oxygen saturation were monitored noninvasively and recorded during surgery using a Datex AS/3 monitor (Helsinki, Finland).

### Hypnotic Induction

Hypnosis, a naturally occurring state, was induced using a permissive approach as described by Milton Erickson, an American psychiatrist.<sup>14,15</sup> The patient places himself or herself in this state. As previously described, the anesthesiologist creates conditions that allow the patient to reach this specific state.<sup>10-12</sup> Hypnotic state was induced by eye fixation and progressive muscle relaxation. The patient was invited to focus his or her attention on a single, freely chosen memory with positive connotations, which helped both to detach from ambient reality and to concentrate on his or her inner self. The anesthesiologist continually gave permissive and indirect suggestions of well-being to maintain the hypnotic process. The exact words and details of the induction technique and specific suggestions during the course of induction varied depending on the anesthesiologists' observations of patient behavior and their judgment of the patient's needs. The content of the message was less important than the way it was delivered. A monotonous voice was used, with intentional use of repetitive meta-

phoric language. A moderate degree of sensory isolation was necessary to accomplish this, provided in part by reducing the activity level in the operating room, eliminating unnecessary conversation, and reducing the volume levels of equipment-related alarms. With onset of the hypnotic state, patients appeared immobile and relaxed, with slow roving eye movements intermingled with ocular saccades; a respiratory and heart rate decrease was frequently observed. The patient remained conscious and felt listless but experienced intense subjective well-being. As shown in volunteers, the hypnotic state is a particular cerebral waking state where the subject, seemingly somnolent, experiences a vivid, multimodal, coherent memory-based mental imagery that invades and fills his or her consciousness.<sup>16</sup> These changes allow surgery to proceed. At the end of the operation, the anesthesiologist (using a normal speaking voice) invites the patient to reestablish contact with the outside world. This serves to restore a fully conscious state within several seconds.

## Surgical Procedure

When the patient was thought to be at an adequate trance level ( $\pm 10$  minutes) with slow eye movements, the head was gently hyperextended. The line of a 5- to 6-cm symmetric collar incision, in a natural skin crease, was infiltrated with a mixture of prilocaine 1% with adrenaline (1:200,000) and bupivacaine 0.5%. The cranial skin-platysma flap was dissected rostrally to the notch of the thyroid cartilage and maintained by stay sutures. The flap was dissected caudally to the suprasternal notch. A bilateral neck exploration was then performed, without section of the strap muscles. Generous medial retraction of the thyroid lobes provided adequate exposure. This is essentially the same technique as routinely used for parathyroid exploration under general anesthesia. All four glands were explored. The recurrent laryngeal nerve was not exposed routinely. During the procedure, the patient was reminded to mention any discomfort using a prearranged signal (wink, grimace). When required, the operative site was reinfiltrated using the same mixture of local anesthetics. No drains were left in place at the end of the procedure, and the skin was closed intradermally.

## Postoperative Phase

As with general anesthesia, postoperative analgesia consisted of 2 g propacetamol (a precursor of paracetamol; 2 g propacetamol = 1 g paracetamol [acetaminophen in the United States]) given intravenously and 40 mg tenoxicam given intramuscularly. After a brief stay (60 minutes) in the postanesthesia care unit, the patient was transferred to the ward, where 500 mg paracetamol plus 30 mg codeine phosphate was given orally at the patient's request every 6 hours. The patient was allowed to ambulate immediately. Oral intake was also permitted. The patient was discharged from

the hospital early in the morning after surgery, which permitted overnight surveillance of the surgical site for the development of hematoma. Before discharge, flexible fiberoptic laryngoscopy was prescribed in case of voice change, and two consecutive measurements of serum calcium were obtained. Patients had an initial follow-up visit at the outpatient clinic 10 days after the procedure, during which the routine serum calcium level and immunoradiometric PTH assays, when required, were monitored.

## Method of Evaluation

For each patient, the following parameters were recorded:

- Duration of the surgical procedure
- Requirements for local anesthesia and intravenous sedation
- Operative findings (uni- or multiglandular disease, location of abnormal parathyroid tissue, associated procedures)
- Weight and size of specimen
- Blood loss (estimated by weighing sponges)
- Incidence and nature of complications
- Duration of hospital stay.

Postoperative pain and patient satisfaction were assessed using a 10-point visual analog scale (VAS) (0 = no pain at all; 10 = intractable pain).<sup>17,18</sup> Operative surgical conditions were also rated by the surgeons on a same VAS scale (0 = poor conditions; 10 = excellent conditions). Analgesic consumption was recorded for the first postoperative day. For all patients younger than age 60, time to full return to social or professional activity was noted.

## Statistical Evaluation

Statistical calculations were performed using the SPSS for Windows, release 7.0 software package. Results are expressed as mean  $\pm$  standard deviation.

## RESULTS

### General Results

All the patients but one in this series are alive. A normocalcemic 81-year-old patient died from myocardial infarction in the third postoperative month. All the patients are currently normocalcemic and considered cured, with a mean follow-up of  $18.1 \pm 12.6$  months. As the anesthesiologists and endocrine surgeons gained experience and the patients' apprehension concerning hypnosis decreased, the yearly proportion of patients operated on under hypnosis decreased, the yearly proportion of patients operated on under hypnosis increased from 17.5% in 1995 to 42.5% in 1997.

**Table 1. ACCURACY OF PREOPERATIVE LOCALIZATION STUDIES IN 31 PATIENTS OPERATED ON FOR PRIMARY HYPERPARATHYROIDISM UNDER HYPNOSEDATION**

Localization Studies	# of Examinations	True Positive	False Negative	False Positive
High-resolution ultrasonography	25	12 (48%)	11 (44%)	2 (8%)
Sestamibi technetium-99m scintigraphy	19	9 (47.4%)	9 (47.4%)	1 (5.2%)
Computed tomography	9	1 (11.1%)	7 (77.8%)	1 (11.1%)
18 FDG PET scan	3	1 (33.3%)	1 (33.3%)	1 (33.3%)

## Operative Data

No conversion to general anesthesia was needed. All procedures were completed as initially planned with a mean operative time of  $55 \pm 17$  minutes. Four parathyroid glands were identified in 26 cases (83.9%), three glands in 3 cases (9.7%), and only two glands in 2 cases (6.4%). In these two cases, which involved the two oldest patients in the series (81 and 85 years old) and the two largest adenomas (30 and 45 mm), a limited exploration of the neck was carried out because of positional discomfort related to cervical hyper-extension. Cervical exploration was terminated after identification of the adenoma and at least one normal parathyroid gland. A single adenoma was found in 26 cases (83.9%). Adenomas were developed from the right and left upper glands in 10 and 5 cases respectively; right and left lower glands were involved in 5 cases each. In four cases arising from upper glands, the adenoma was found in the paraesophageal space in the superoposterior mediastinum; two adenomas involving the lower glands were found within the thymic tongue behind the clavicle. Multiglandular disease was observed in five patients (16.1%), in whom subtotal parathyroidectomy and transcervical thymectomy were performed. The mean weight and mean maximal size of the specimens were  $1600 \pm 1900$  mg (range 230 to 8400 mg) and  $18.8 \pm 8.6$  mm (range 8 to 45 mm), respectively. In four patients, a simultaneous thyroid lobectomy was performed for a cold nodule diagnosed before surgery. Mean operative bleeding, estimated by the weight of the sponges, was  $18.6 \pm 5.7$  ml.

The mean dose of local anesthetic was  $43.2 \pm 11$  ml, of which 30 ml was injected along the incision and into the plane of the strap muscles while raising the subplatysmal flap. Subsequent injections were used if required for discomfort. This was occasionally necessary for the dissection near the superior pole of the thyroid while locating the superior laryngeal nerve. The use of intravenous medication was minimal ( $2.4 \pm 0.8$  mg midazolam and  $526 \pm 191$   $\mu$ g alfentanil). All patients remained conscious and in contact with the anesthesiologist throughout surgery.

## Preoperative Localization Studies

Table 1 summarizes the accuracy of each preoperative localization study. These explorations were unable to detect

multiglandular disease before surgery. Indeed, both false-negative (*i.e.*, one gland identified, in the presence of multiglandular disease) and false-positive (multiple hot spots during sestamibi technetium-99m scintigraphy in the presence of thyroid nodules and single parathyroid adenoma) results were obtained.

## Surgical Complications

No surgical or general complications were observed in this series. Four patients had transient, asymptomatic, and moderate postoperative hypocalcemia detected on routine testing. In these cases, hypocalcemia was related to a "bone hunger" phenomenon, as confirmed by concomitant relatively high serum levels of PTH.

## Hospital Stay

The average length of hospital stay was  $1.5 \pm 0.5$  days, despite the fact that in elderly patients the duration of hospital stay might be influenced by problems unrelated to the parathyroid disease or elective surgery. Moreover, when stratifying the patients according to the date of their operation, the length of hospital stay progressively decreased from  $1.9 \pm 0.5$  days in 1995 to  $1.0 \pm 0.4$  day in 1997.

## Patient Comfort

Postoperative pain, estimated using a 10-point visual analog scale, during the first postoperative day was  $1.8 \pm 1.7$ . Paracetamol consumption on day 1 was  $792 \pm 558$  mg. All patients having hypnosedation reported altered perception of time during the operation, which most estimated as lasting approximately 15 to 20 minutes. All had subjectively pleasant experiences, involving recollection of past events, and none regretted choosing this technique. All would request the same management again, if necessary. Patient satisfaction also scored highly when expressed on a 10-point visual analog scale ( $9.3 \pm 1.3$ , with 0 representing the worst evaluation and 10 the best).

## Surgical Conditions

Evaluation by the surgeons of operative conditions using visual analog scales revealed high degrees of satisfaction

( $8.9 \pm 0.6$ ). Patient positioning was identical to that under general anesthesia, whereas infiltration of the site with an adrenaline-containing local anesthetic possibly reduced bleeding. During the hypnotic trance, the degree of muscle relaxation was similar to that seen with the use of muscle relaxants. Traction on the muscles did not appear to cause discomfort, and the heart rate remained stable even during potentially painful maneuvers. It was also useful to be able to speak with the patient during some difficult dissections of the recurrent laryngeal nerve. Instances of sudden coughing or movement were exceptional. On the contrary, immobility and detachment may be so intense that the patient needed to be reminded occasionally to swallow, so as to avoid airway obstruction with accumulated secretions.

## Return to Work and Activities

It is generally assumed by Belgian Social Security that after conventional parathyroid surgery under general anesthesia, patients return to work after a 4- to 6-week period of convalescence. After hypnosedation, patients reported a fatigue score on day 10 of  $1.7 \pm 2.0$  (0 = no fatigue at all; 10 = extreme fatigability, bed rest required). For the professionally active patients in this series, full return to activities was accomplished after  $12 \pm 10$  days.

## DISCUSSION

Hypnosis in many forms has been reported and practiced for millennia and was secondarily promoted at the turn of the 19th century by several authors in the clinical arena. The beneficial effects of hypnosis on patients undergoing major surgery have been previously described in clinically and scientifically relevant literature.<sup>10,11,19-23</sup> However, hypnosis remains included in some complementary medicine techniques that have been slow to gain support among allopathic practitioners. This may be caused by its reliance on patient cooperation, a high potential for patient and investigator bias, the lack of appropriate controls, and perceived variation in patient sensitivity. These reasons explain why the medical community has been slow to endorse or use these procedures more regularly.

Nevertheless, although each hypnotic technique has limitations, it is difficult to negate the overall beneficial outcomes that have been widely reported. The details of particular techniques have been extensively reviewed in a statistical metaanalysis of 34 controlled-outcome studies conducted by Mumford et al.<sup>22</sup> More recent reviews have concluded that preoperative hypnosis can significantly shorten the convalescent period, promote physical recovery, aid the emotional response of patients after surgery, and produce dramatic cost savings.<sup>24-28</sup> Most recent prospective, randomized, controlled studies have definitively confirmed that the combination of current medical practices with complementary techniques such as hypnosis results in both medical and psychological benefits to patients.<sup>10,29</sup>

In our experience, hypnosis has been used in the pre- and postoperative period, but its greatest value is in intraoperative use as an alternative to general anesthesia.<sup>10-13</sup> Because of excellent results in the use of hypnosedation in plastic surgery, we considered applying the same strategy in cervical endocrine surgery as a possible means of improving the cost/benefit ratio of these procedures, which are usually performed under general anesthesia. In particular, there is currently no consensus as to the best surgical strategy in primary hyperparathyroidism. There is no protocol that combines the undeniable advantages of the available approaches without entailing prohibitive risk or expense. The present study was designed to test the possibility that bilateral exploration under hypnosedation may constitute the best current management of primary hyperparathyroidism.

Once a correct diagnosis of hyperparathyroidism has been established, bilateral neck exploration and visualization of all four parathyroid glands has long been considered the procedure of choice for definitive cure because it decreases the risk of missing supranumerary glands or multiple adenoma while avoiding the need for expensive preoperative localization.<sup>2-4</sup> Indeed, when performed expertly, it is an operation that can be applied to a nonselected population of patients with a success rate >95% and negligible complications.<sup>3</sup>

In this series, bilateral exploration under hypnosedation resulted in a 100% cure rate with no complications. The major argument for unilateral exploration is that it is a less invasive procedure. This seems unjustified in light of the fact that complications related to the extent of the dissection (particularly nerve or parathyroid injury) are no greater with a bilateral approach (about 1%).<sup>3</sup> Therefore, the determination of the most appropriate surgical management should not be decided on the extent of the dissection alone, but with consideration of all the parameters that influence cost and efficacy—preoperative evaluation, rate of cure and complications, patient comfort, operative time, duration of hospitalization, and recovery.

In the standard bilateral approach, length of hospitalization remains probably the most negative economic factor because of the widespread use of general anesthesia. These costs may be partially balanced by the absence of preoperative localization studies. However, general anesthesia involves nonnegligible risk, particularly in elderly patients with associated medical conditions, and certainly influences the timing of hospital discharge.<sup>30,31</sup> Because primary hyperparathyroidism concerns an increasing population of elderly patients, avoiding general anesthesia while providing identical surgical conditions should be considered significant progress.

The technique of hypnosedation we used in this series may be widely applied. All patients with primary hyperparathyroidism responded well to hypnosedation, regardless of age or the pathologic substratum of their disease. There is no need for preoperative testing of hypnotic susceptibility or patient training sessions. The major prerequisite is in-

formed consent. In our center, this consent and indeed requests for the procedure increase yearly as the confidence of the general population and medical community increases.

The mean hospital stay in 1997 was 1 day, and the latest patients in this series were considered in a true outpatient setting.

The literature shows that most unilateral neck explorations were initially conducted under general anesthesia.<sup>9,32,33</sup> This approach requires expensive attempts to localize the adenoma before surgery and strict preselection of patients. Its only putative benefit is a reduction of the 1% morbidity rate associated with bilateral exploration. Moreover, Duh et al<sup>34</sup> demonstrated that only 62% of the patients with intention to treat by unilateral approach would effectively undergo unilateral exploration if a localization study with a sensitivity of 80% were used before surgery. Some proponents of unilateral exploration have reported procedures conducted under local anesthesia, reducing the incidence of potential hazards in medically compromised patients.<sup>6-8,35,36</sup> Nevertheless, for such procedures, it is especially important to localize a single adenoma before surgery and to confirm during surgery that the resection has been adequate. If noninvasive localization is performed, the results of at least two tests should agree because of the high incidence of false-positive results.<sup>37</sup>

If the results of preoperative high-resolution ultrasonography had been used for selection in the patients in our present series, only 56% would have been eligible for an unilateral approach under local anesthesia, as described by Chapuis et al.<sup>6,7</sup> On the contrary, under hypnosedation and without any need for preoperative localization, all our patients were cured, despite intraoperative finding of multiglandular disease in 16% of cases, an incidence corroborated elsewhere.<sup>34</sup> Moreover, during focused operation in the selected subpopulation reported by Chapuis et al,<sup>6,7</sup> cure of primary hyperparathyroidism was confirmed by expensive intraoperative monitoring of 1-84 PTH levels in 90% of the patients. The remaining 10% were followed by long-term medical treatment or definitively cured by bilateral exploration under general anesthesia.

Norman and Chheda<sup>8</sup> recently reported a more attractive minimally invasive operation under local anesthesia, facilitated by intraoperative nuclear mapping by sestamibi scanning using a handheld gamma detector placed into the tissues. Nevertheless, this procedure remains questionable because of radiation exposure, potential false-positive results from nodular thyroid disease, and cost effectiveness. In addition, because of the need for expensive intraoperative scanning equipment, this procedure is also restricted to a subpopulation of patients with a positive preoperative sestamibi scan. Again, had this selection criteria been applied in our series, 47% of the patients with a negative preoperative sestamibi scan would have been excluded. Accordingly, we agree with others that the potential benefits of such focused and unilateral approaches (in comparison with

conventional bilateral exploration) may not outweigh their costs.<sup>38,39</sup>

Given the current propensity toward minimally invasive surgery, endoscopic parathyroidectomy has been performed.<sup>40</sup> This "minimally invasive" procedure was conducted under general anesthesia, took several hours to perform, required several days of hospitalization, and exposed the patient to significant risks of hypercapnia and extensive subcutaneous emphysema. Videocervicospscopy requires expensive new videoscopic equipment that has to be justified in a period of limited health care budgets. This procedure also presents a major problem when dealing with concurrent thyroid disease.<sup>41</sup> At the level of its present development, this new approach could be considered, in comparison with conventional open surgery, a maximally invasive procedure. Any conceivable benefit has yet to be demonstrated.

The most cost-effective advance in parathyroid surgery to date is that reported by Lo Gerfo's team.<sup>42</sup> They describe a series of 49 patients in whom locoregional anesthesia and sedation were successfully employed during parathyroid surgery. A deep bilateral cervical plexus block, combined with local anesthesia and intraoperative low-dose midazolam, permitted curative surgery in all cases (adenomas or hyperplasia) without the need for preoperative localization studies. Total or partial thyroidectomy was simultaneously performed when necessary.

In comparison to this technique, hypnosedation has the advantages both of avoiding the complications associated with regional anesthesia (intraarterial injection, phrenic nerve infiltration) and providing a well-demonstrated reduction in perioperative pain and anxiety.<sup>10</sup> Vital signs are significantly stabilized during hypnosedation, even with reduced doses of alfentanil and midazolam. Hypnosedation thus maximizes both patient satisfaction and surgical conditions. A prospective randomized study we conducted during plastic surgery procedures and published elsewhere clearly demonstrated this superiority of hypnosedation over local anesthesia with intravenous sedation.<sup>10</sup>

Accordingly, from our recent experience in hypnosedation applied to surgery for primary hyperparathyroidism, we consider that this innovative approach is currently very safe and effective and probably the most cost-effective procedure for neck exploration. Given the interest and the expertise of the anesthesiologist, and the willing participation of the patient, this is an excellent tool that may have much wider applications than currently appreciated. There are as yet no complications or drawbacks associated with hypnosis, and the advantages are numerous, representing an ideal combination of the benefits of current management of primary hyperparathyroidism:

- Hypnosedation may be recommended for routine use in all patients, not only for elderly, medically compromised patients but also for all those who are fit for general anesthesia.<sup>43</sup>
- There is no need for preoperative determination of

susceptibility to hypnosedation; the only condition required is the patient's agreement and cooperation.

- There is no need for invasive or noninvasive preoperative localization studies.
- A complete bilateral neck exploration and associated procedures (thyroidectomy, thymectomy) can be easily performed.
- Surgical conditions are considered excellent, requiring a short operative time with minimal blood loss.
- Patient and surgeon satisfaction are very high.
- Hypnosedation provides excellent perioperative pain and anxiety relief, with minimal requirements for local anesthesia and intravenous sedation.
- Hypnosedation reduces the incidence of side effects associated with general anesthesia and allows rapid postoperative recovery.
- The socioeconomic impacts are obvious (very short hospital stay, very low requirements for analgesics, no need for expensive anesthetic agents, early full return to activity).

In light of these results, we conclude that bilateral neck exploration for primary hyperparathyroidism may be performed safely, efficiently, and in a very cost-effective manner under hypnosedation. Therefore, we propose its consideration as a new standard of care.

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