Innovative Grid Positioning System (GPS) Guidance for Endoscopic Transforaminal Microdecompressive Lumbar Disc Surgery in the Morbid Obese Patient

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Introduction
Morbid obesity is characterized by an individual having a body mass index (BMI) of 40 or higher. The morbidly obese patient poses many unusual surgical/anatomical challenges during endoscopic minimally invasive spine surgery (MISS), especially to target the lesion with precision and accuracy through a surgical portal of entry. The problem that faces the surgeon performing MISS is that it is done with limited surgical exposure and visualization of the surgical field.

Methods
In response a logical and simple Grid Positioning System (GPS) was developed to provide a precise surgical trajectory/approach for the disc lesion to undergo decompression.

Material and Method
- Since 1995, 203 morbidly obese patients have undergone endoscopic lumbar disc surgery
- Average age of 42.2 (20-67) years
- Symptomatic, single or multiple herniated lumbar discs
- Male: 99 Females: 104
- Each failed at least 12 weeks of conservative care
- Post operative follow up 7 to 50 mos (average 46.1 months)
- Demographics of 330 Herniated Lumbar Discs

GPS (Grid Position System) for Endoscopic MISS

Surgical Technique with GPS
A Large Herniated Lumbar L1 Disc treated with GPS

Portal of Entry into the GPS

Conclusions
Applying the concept of Grid Positioning System (GPS) to MISS can help the surgeon to facilitate the MISS process by quickly identifying the surgical portal of entry to the disc without compromising vital anatomical or neural structures and accomplish needed spinal microdecompression, especially in medically high-risk patients including the morbidly obese and even those with prior surgeries. It can be very effective in surgical treatment of degenerative spine and herniated lumbar discs condition.

Learning Objectives
1. By the conclusion of this session, participants should be able to describe endoscopic transforaminal microdecompressive lumbar disc surgery for morbid obese patients 2. To discuss the definition of a morbid obese patient being 100 lbs over ideal body weight, with a high body mass index (BMI) which significantly increases surgical complications in these patients 3. To identify the effective surgical technique with GPS System (grid positional system) which facilitates the spinal surgery and reduces surgical complications

References
Introduction

The morbid obese - more than 100 pounds over ideal body weight, or a BMI of 40 or higher. More than 5 percent of Americans

Double the incidence (2.41x) of low back pain

Greater incidence of surgical complications, up to 36% including wound healing, infection, pneumonia, DVT and repeated surgery

Under anesthesia, have increased risks including difficult airway control and intubation, ventilation/perfusion mismatching, altered pharmacokinetics of anesthetics and drugs

Risk of developing other co-morbidity diseases, i.e. diabetes, hypertension, cardiovascular disease, stroke, restrictive lung disease, osteoarthritis and others

Six or more co-morbid conditions in 25 percent

1680 painting of an obese girl by Juan Carreno de Miranda
Material and Method

- Since 1995, 203 morbidly obese patients – 330 herniated lumbar discs
- Average age of 42.2 (20 to 67) - symptomatic, single or multiple herniated lumbar discs
- Males: 99 Females: 104
- Each failed at least 12 weeks of conservative care
- Post operative follow up: 7 to 60 mos. (average 46.1 months)
Introduction

**Advantages of** Minimally Invasive Spinal Surgery (MISS) for the **Morbid Obese:**

- Through a very **small incision**
- **Less tissue trauma** – tissue sparing approach
- MISS has **fewer complications** (less than 1%)
- Often **local anesthesia** with **IV sedation**
- **Early ambulation and post–op exercise**
- **Ideal for high risk** anesthetic patients including morbidly obese, emphysematous, and cardiac conditions
- **IOM** - Intra-operative neurophysiological/EMG monitoring, and **direct visualized endoscopy** provides a safer surgery
- **Preserves spinal motion**
The Lumbar Spine **GRID** – Basis for GPS

- In order to reach the lumbar discs or lesion precisely and to avoid trauma to the nerve vessels, DRG, dura and even the spinal cord
- Need to have a precise path to reach the lesion
- The location should be precisely localized – in the grid – GPS System – Zones (in A,B,C, D and 1,2,3)
GPS (Grid Position System) for Endoscopic MISS

Right posterolateral approach - prone position

Left lateral decubitus position for right posterolateral endoscopic lumbar MISS
Mini Endoscopic Spinal Surgical Instruments for MISS

- Endoscopic duck bill tubular retractor, slanted opening
- For navigating into the grid – GPS to avoid neural vascular injury
- To remove difficult deep lesions, even behind the pedicle
- The duck bill opening of tubular retractor is manipulated and rotated in a clockwise manner, on the left spinal foramen at 10 o’clock, 12 o’clock, 3 o’clock and 6 o’clock
- For successful endoscopic MISS
Larger (12mm) spinal endoscope can accommodate larger instruments and cutter forceps with teeth for removal of a large herniated disc or Intraspinal lesion.
Surgical Technique with GPS
A Large Herniated Lumbar L5 Disc treated with GPS

- 73-year-old neurosurgeon suffering from severe back and left leg pain
- MRI Scan: L-spine revealed a large partially extruded L5-S1 disc at left lateral recess
- With assistance of fluoroscopic/imaging data via GPS system, laser MISS provided excellent symptomatic relief
Case Illustration

- Morbidly Obese

- 36 year old male, 450 lbs, one hour after his successful endo L4 & L5 micro discectomy with GPS

- He was turned down for open lumbar disc surgery due to morbid obesity