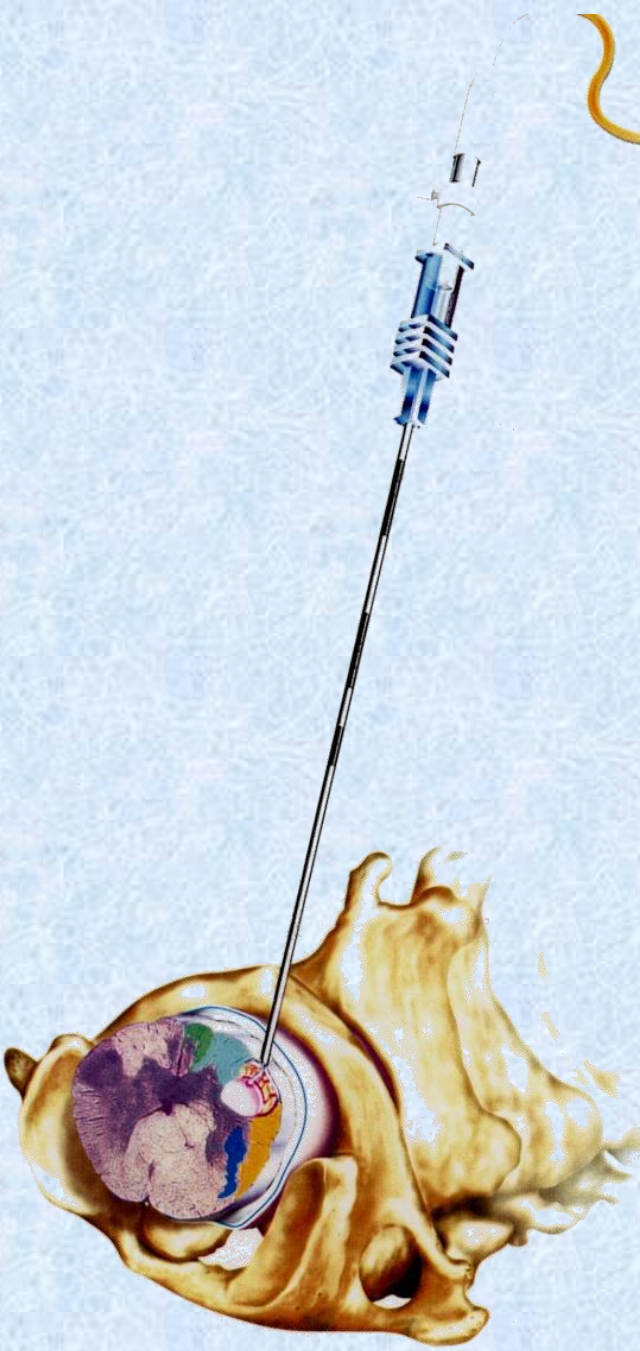


# AĞRI CERRAHİSİ

*Prof. Dr. Ali Savaş*

Ankara Üniversitesi Tıp Fakültesi  
Beyin ve Sinir Cerrahisi Anabilim Dalı

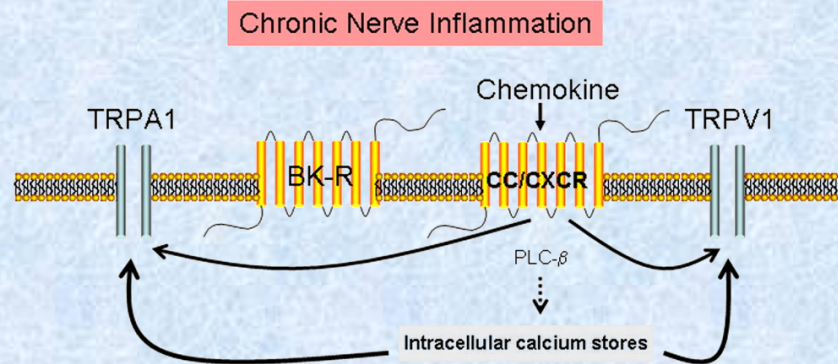
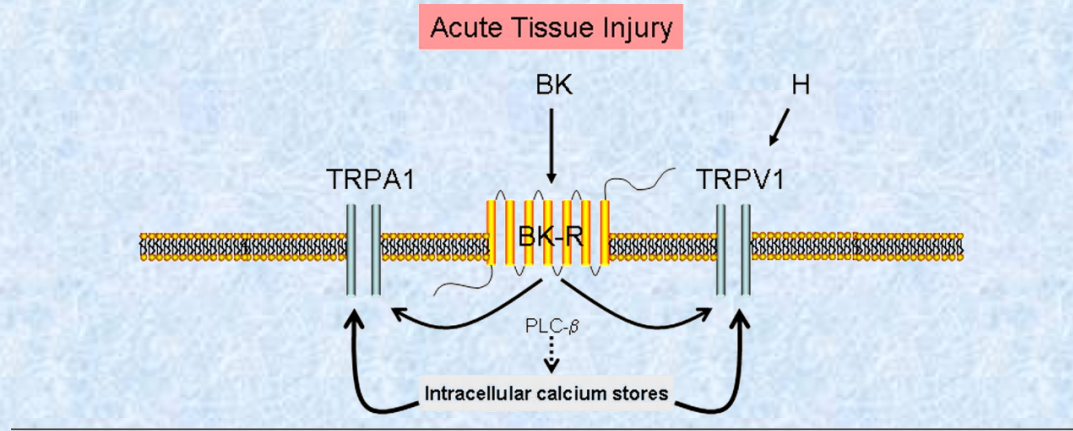


# AĞRININ CERRAHİ TEDAVİSİ

## PERİFERİK vs. SANTRAL MEKANİZMA

### Nörojenik vs. Nöropatik Ağrı

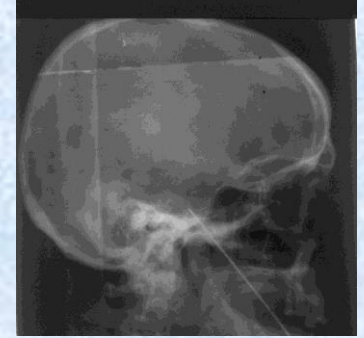
### Nevraljik vs. Nöropatik ağrı





# AĞRININ CERRAHİ TEDAVİSİ

## PERKUTAN DESTRUKTİF AĞRI CERRAHİSİ (İntradural Yöntemler)



- TRİGEMİNAL RADYOFREKANS (RF) RİZOTOMİ VE TRİGEMİNAL NEVRALJİ

- PERKUTAN KORDOTOMİ
- PERKUTAN TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ
- PERKUTAN EKSTRALEMNİSKAL MYELOTOMİ



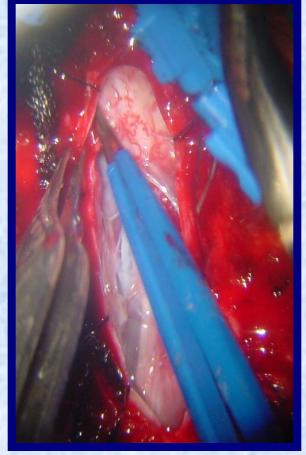


# AĞRININ CERRAHİ TEDAVİSİ

## AÇIK CERRAHİ İLE DESTRUKTİF AĞRI CERRAHİSİ

*1- SPİNAL DREZ AMELİYATI*

*2- TRİGEMİNAL DREZ AMELİYATI*



## MİKROVASKÜLER DEKOMPRESYON



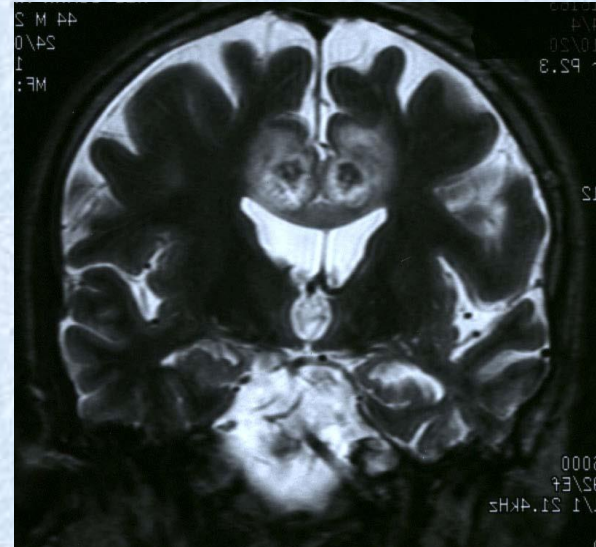
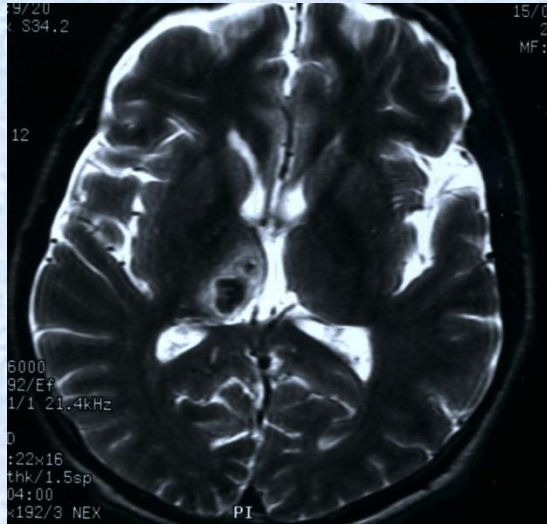


# AĞRININ CERRAHİ TEDAVİSİ

## STEREOTAKTİK CERRAHİ İLE SEREBRAL DESTRUKTİF AĞRI TEDAVİSİ

1- STEREOTAKTİK TALAMOTOMİ

2- STEREOTAKTİK SİNGULOTOMİ





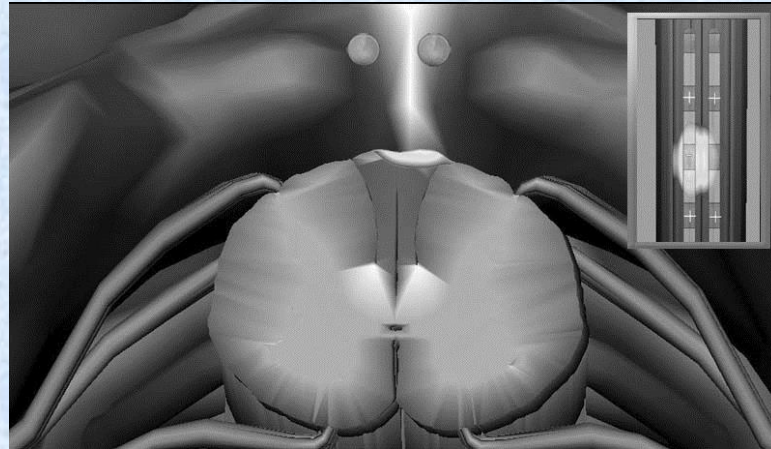
# NÖROSTİMULASYON VE NÖROMODULASYON YÖNTEMLERİ

1- SPİNAL KORD STİMULASYONU

2- MOTOR KORTEKS STİMULASYONU

3- DERİN BEYİN STİMULASYONU

4- İNTRATEKAL İLAÇ & MORFİN İNFÜZYONU





# TRİGEMİNAL NEVRALJİ

## ANKARA ÜNİVERSİTESİ TIP FAKÜLTESİ

✚ **Mikrovasküler Dekompresyon**

✚ **Radyofrekans Rizotomi**

✚ **Gliserol Rizoliz**

✚ **Balon Mikro-kompresyon**

✚ **Gamma Knife ..vb**



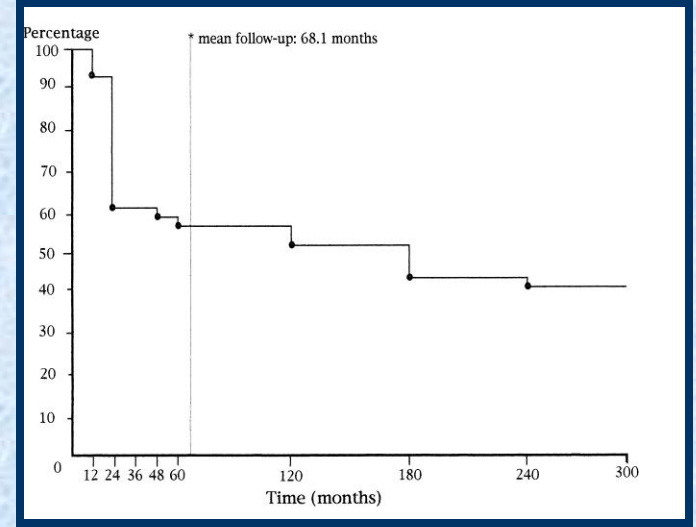


ANKARA ÜNİVERSİTESİ TIP FAKÜLTESİ  
NÖROŞİRÜRJİ ANABİLİM DALI  
**SONUÇLAR**

## İDİOPATİK TRİGEMİNAL NEVRALJİ

- TRİGEMİNAL RF RİZOTOMİ:** 1600 Hasta- 25 yıl takip (M: 70 ay)

Takip-Yıl	Tek RF	Multi. RF
5	% 57	% 92
10	% 52	% 94
15	% 42	% 97
20	% 41	% 100

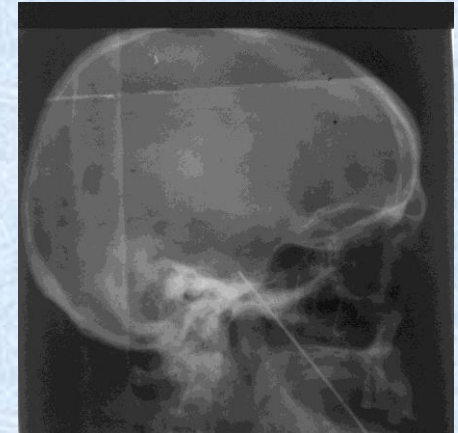


### CLINICAL STUDIES

#### Percutaneous Controlled Radiofrequency Trigeminal Rhizotomy for the Treatment of Idiopathic Trigeminal Neuralgia: 25-year Experience with 1600 Patients

Yücel Karpolat, M.D., Ali Savaş, M.D., Ph.D.,  
Ahmet Bekar, M.D., Çağlar Berk, M.D.

Department of Neurosurgery (YE, AS, CB), Ankara University School of Medicine,  
Ankara, Turkey, and Department of Neurosurgery (AB), Uludağ University School of  
Medicine, Bursa, Turkey







ANKARA ÜNİVERSİTESİ TIP FAKÜLTESİ  
NÖROŞİRÜRJİ ANABİLİM DALI  
SONUÇLAR

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- **TRİGEMİNAL RF RİZOTOMİ:**
  - 1600 Hasta (3800)- 25 yıl takip (M: 70 ay)
- **Mortalite: %0**
- Yan etki: hipoaljezi (selektif kontrollü –RF)
- **Komplikasyon (>%1):**
  - Kornea refleks kaybı: %5.7
  - Masseter parezisi- %3
  - Dizestezi - %1
  - Anestezi doloroza- %0.8, Keratid: %0.6



---

*Kanpolat Y, Savas A, Bekar A, Berk C:*

*Percutaneous controlled radiofrequency trigeminal rhizotomy for treatment of idiopathic trigeminal neuralgia: a 25-year experience with 1,600 patients.*

*Neurosurgery (March) 48: 526-532, 2001*



# Mikrovasküler Dekompresyon

## Trigeminal nevralji & Vago-glossofaringeal nevralji

202 Hasta

- ✚ Etkin ama etki mekanizması bilinmiyor
- ✚ Dekompresyon vs. Kompresyon
- ✚ Trigeminal sinir “entry zone”da bipolar koagulasyon
- ✚ % 92 Başlangıçta ağrı kontrolü
- ✚ % 3.5-%1.5 yıllık Ağrı Rekurrensi (10 yıl-%35)



**Mortalite: % 0**



# TRİGEMİNAL NEVRALJİ

**Trigeminal Nevralji çeşitli cerrahi tedavi yöntemleri olan bir hastalıktır.**

**Yöntem seçimi hastanın özellikleri ve beyin cerrahına göre değişebilir.**

**MVD ve Trigeminal Radyofrekans Rizotominin diğer yöntemlere üstünlüğü yönünde kanıtlar vardır;**

**ancak birbirine üstünlüğü kanıtlanamamıştır!**

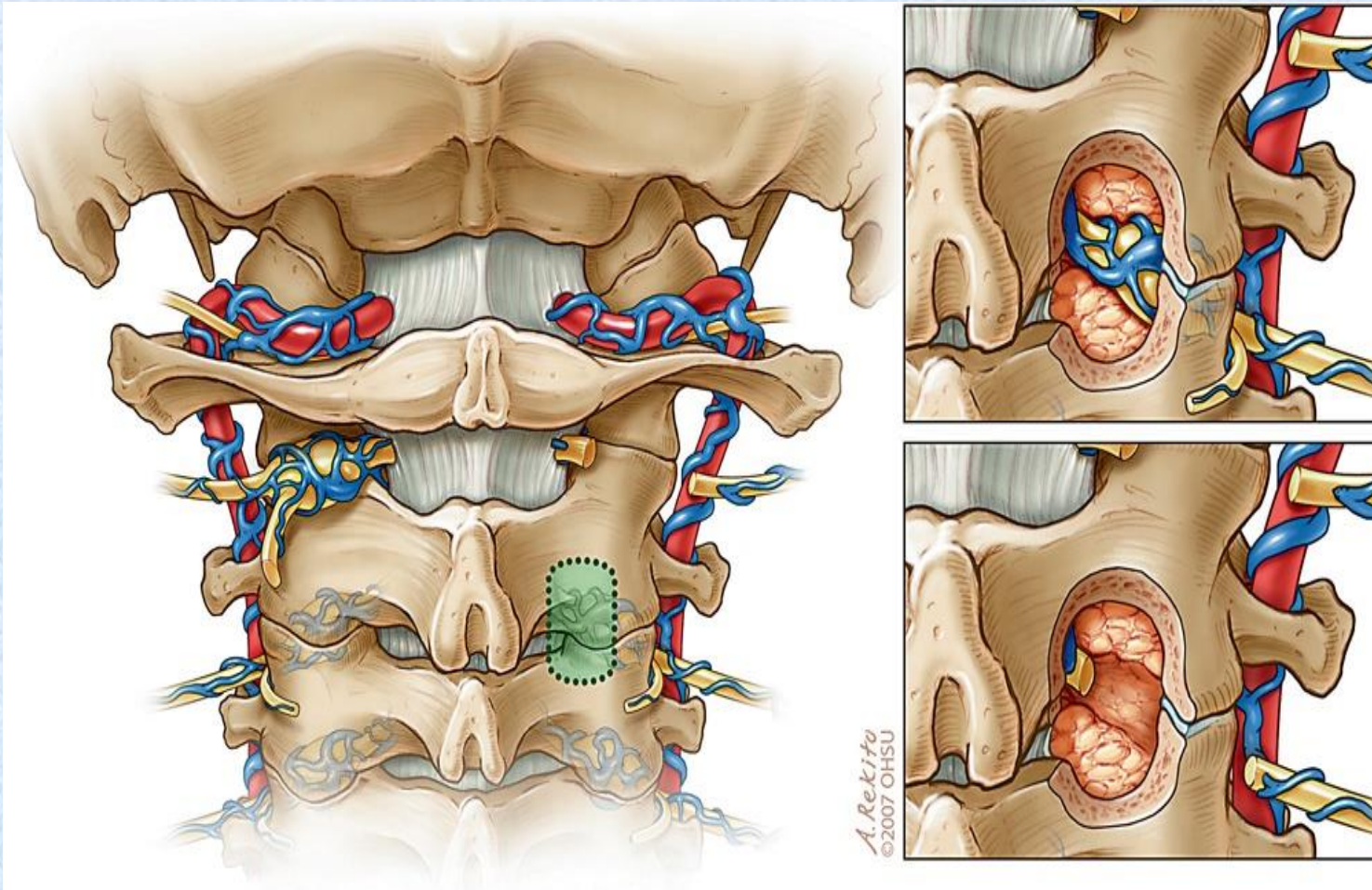


*VS*



# OKSİPİTAL NEVRALJİ

## SERVİKAL GANGLİONEKTOMİ (C-2, C-3)

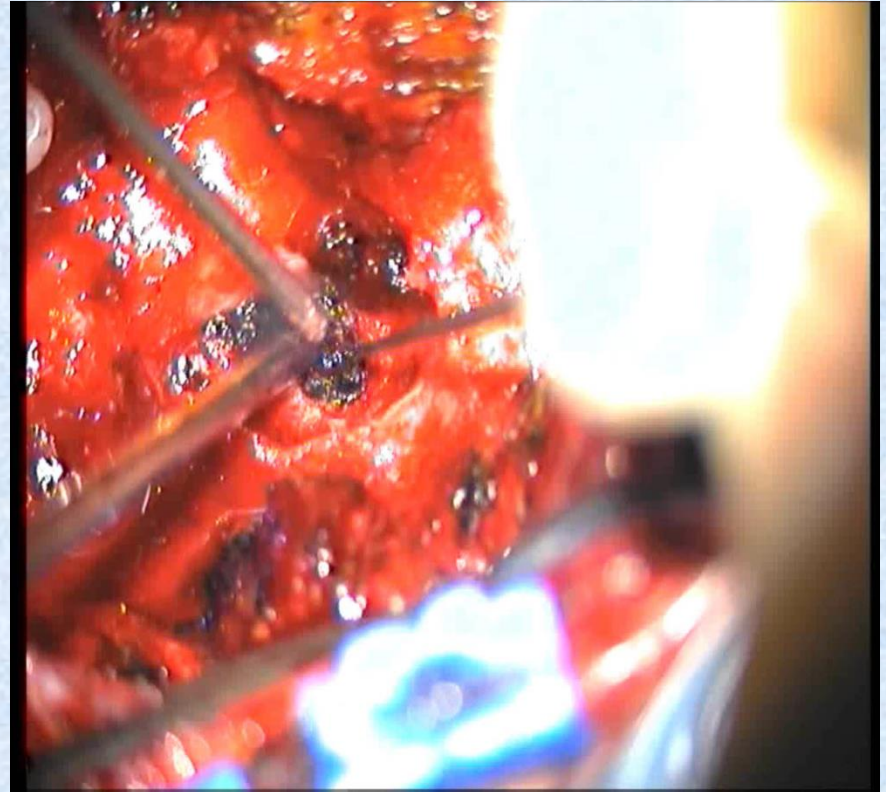
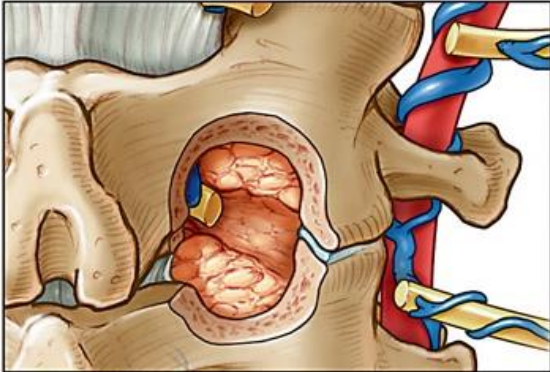
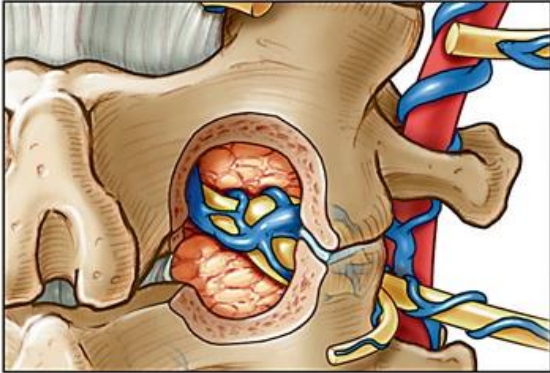




# OKSİPİTAL NEVRALJİ

## SERVİKAL GANGLİONEKTOMİ (C-2, C-3)

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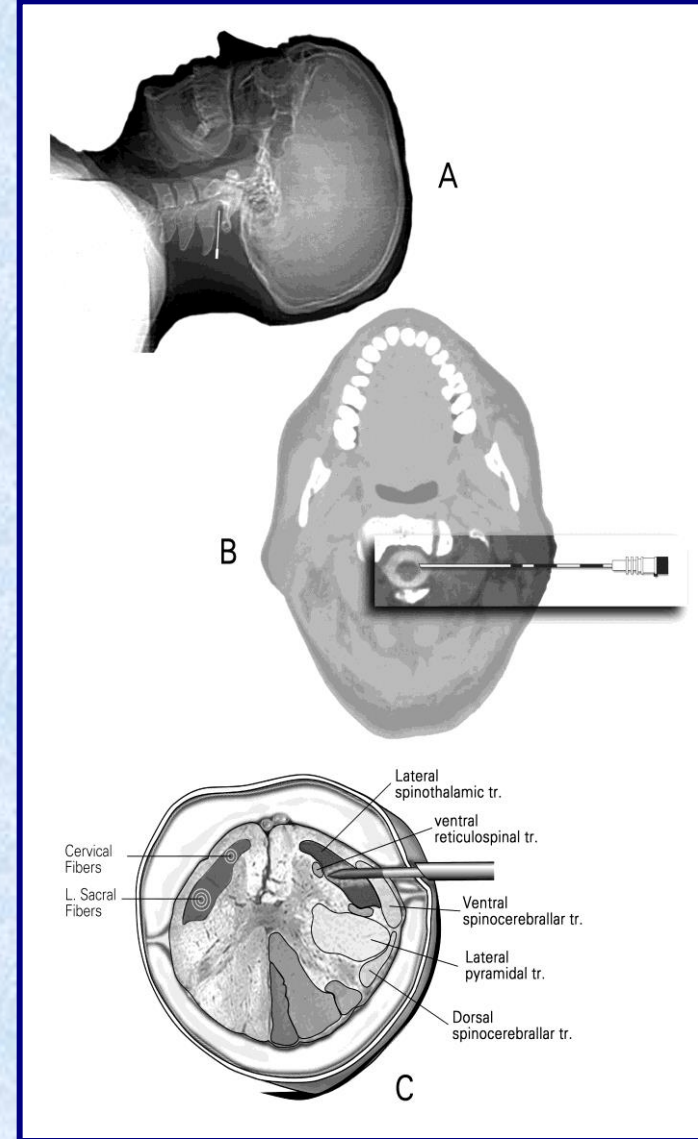


# “BT EŞLİĞİNDE” PERKUTAN KORDOTOMİ

- Medikal tedaviye yanıt vermeyen somatik & nosiseptif Lateralize kanser ağrıları

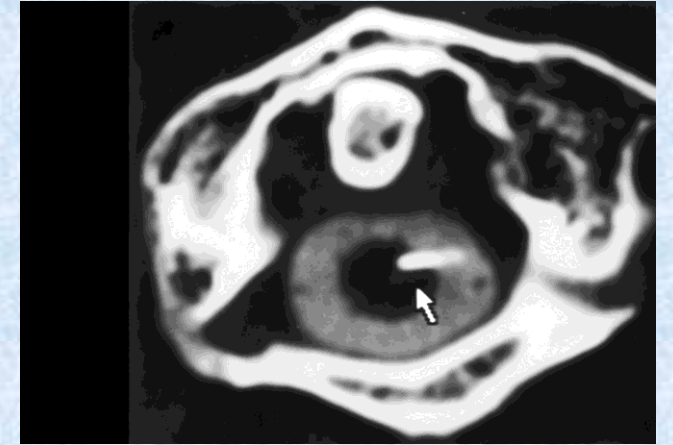
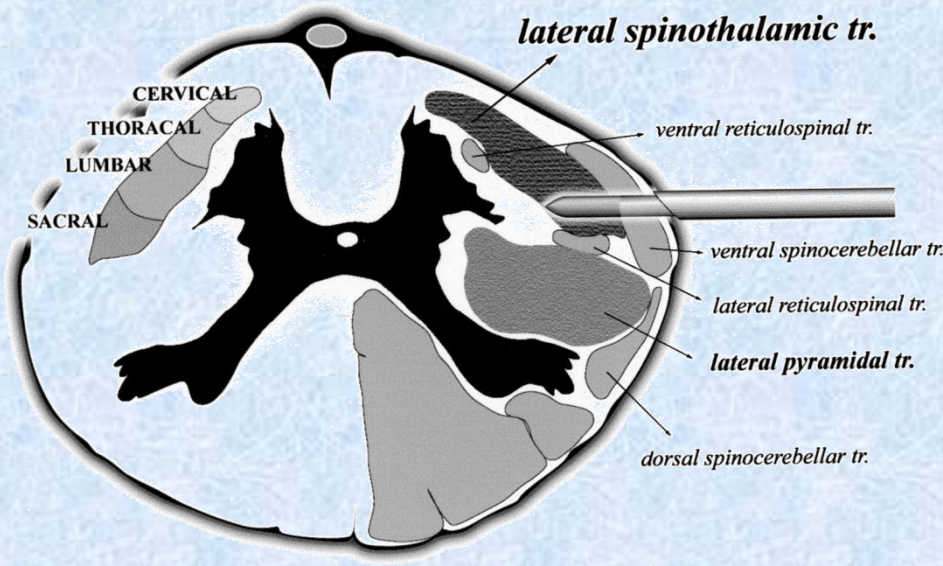
(Akciğer ca., Mezotelioma, ...vb)

- Kanser dışı ağrı (?)
- Nöropatik ağrı (?)
- Bilateral Uygulama





# “BT EŞLİĞİNDE” PERKUTAN KORDOTOMİ



## TEKNİK VE UYGULAMA:

- 6- Elektrodun korda girişi, doku empedansı ve BT’de pozisyon
- 7- Elektriksel stimülasyon, fonksiyonel lokalizasyon ve RF termik lezyon (65o C)



# “BT EŞLİĞİNDE” PERKUTAN KORDOTOMİ

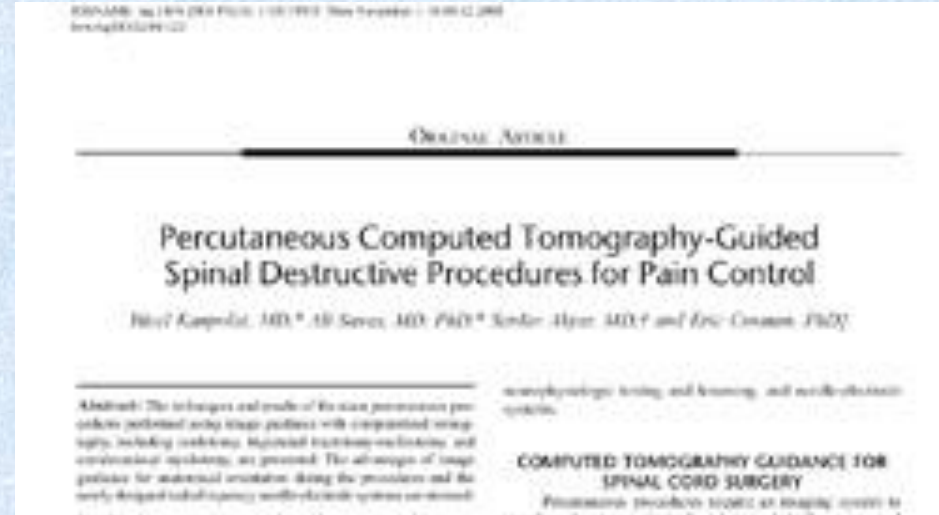
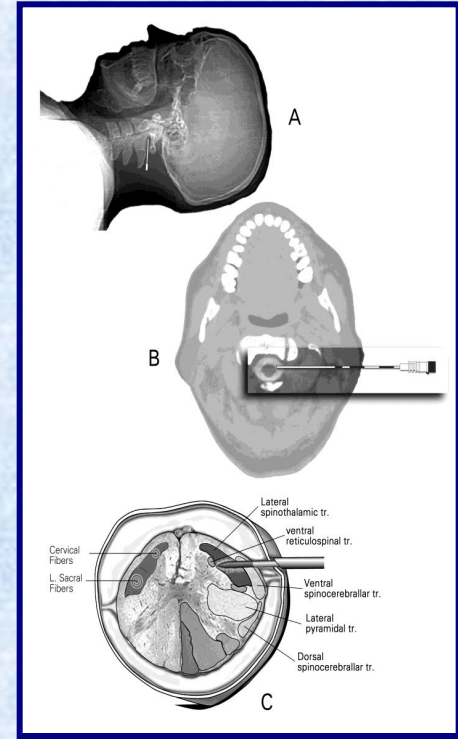
- Medikal tedaviye yanıt vermeyen somatik & nosiseptif kanser Ağrılarında

% 96 Ağrı kontrolü

- Komplikasyon: Minor-geçici  
5 parezi, 3 ataksi, 3 disestezi,  
1 üriner, 1 hipotansiyon

- Major komplikasyon: 0  
Apne, pleji ...

- Mortalite - 0







# NÖROPATİK AĞRI CERRAHİ TEDAVİ

## TANI - İSİMLENDİRME

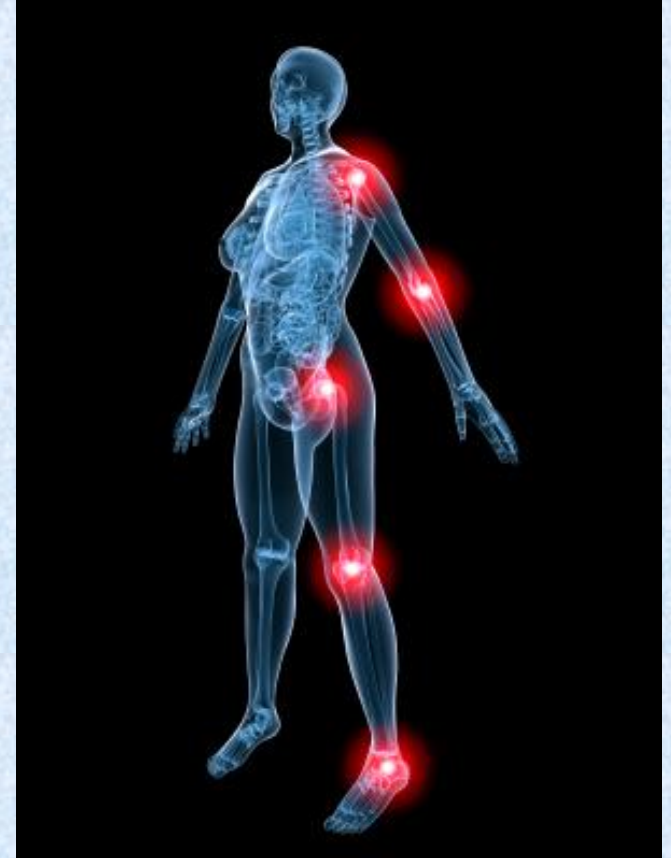
### KRANİOFASİYAL AĞRI:

- ✚ Atipik trigeminal nevralji & “Failed TN”
- ✚ Atipik Fasial Ağrı
- ✚ Fasial nöropatik ağrı
- ✚ Anestezi dolorosa

### SOMATİK AĞRI

- ✚ “Failed back surg.” post-op.
- ✚ Kanser ağrısı
- ✚ Postherpetik nevralji
- ✚ Travmatik nöropati
- ✚ Fantom & avulsiyon ağrısı
- ✚ Brakial pleksus lezyonu ağrısı
- ✚ Kozalji & allodinia

### ✚ TALAMİK VEYA SANTRAL AĞRI



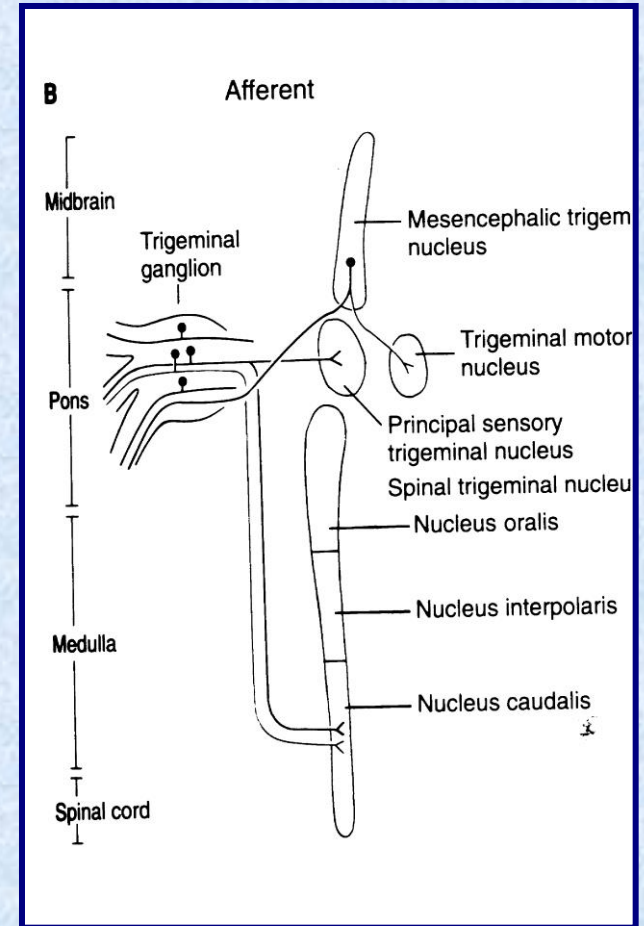
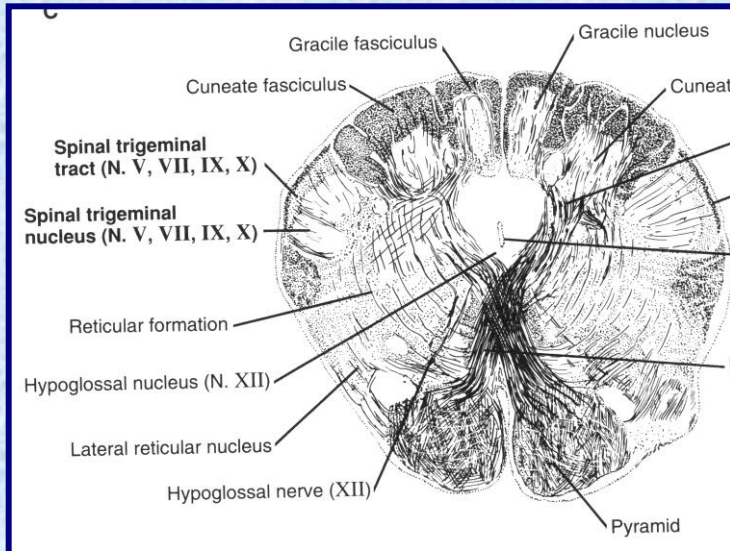
## SANTRAL MEKANİZMA



# NÖROPATİK AĞRI – CERRAHİ TEDAVİ

## ANATOMİK BÖLGELER

- Ağrı yolları ayrılır-V, VII, IX, X katılır  
Descending cranial nociceptive tract  
**Trigeminal traktus**
- Spinal Trigeminal Nukleus  
**Nucl. Caudalis**  
Spinomeduller Junction-C<sub>2</sub>

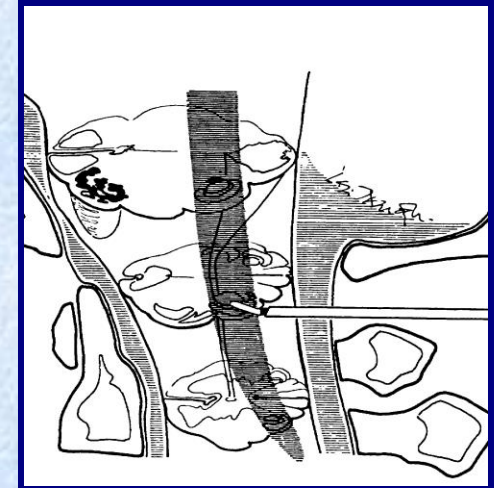
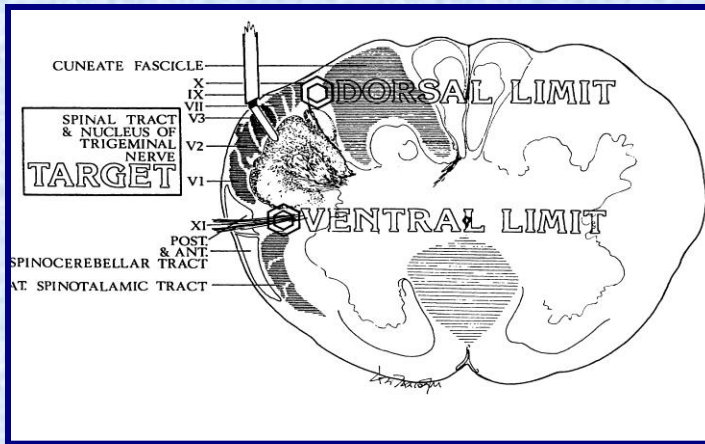
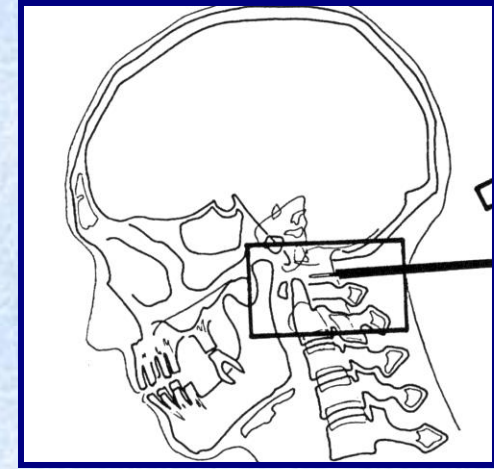




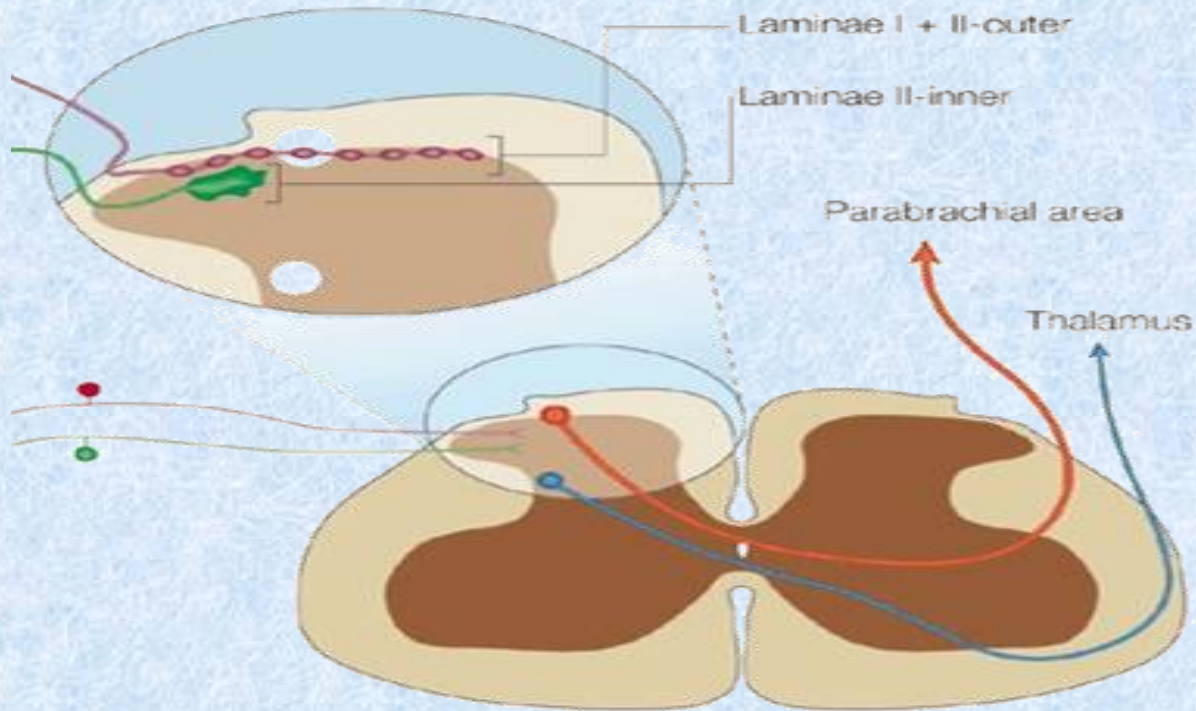
# NÖROPATİK AĞRI – CERRAHİ ANATOMİ

## TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ & DREZ

- Ağrı yolları ayrılır-V, VII, IX, X katılır  
Descending cranial nociceptive tract  
**Trigeminal traktus**
- Spinal Trigeminal Nukleus  
**Nucl. Caudalis**  
Spinomeduller Junction-C<sub>2</sub>



- Spinal DREZ
- Substantia gelatinosa
- Rexed lamina (I-III)





# TRİGEMİNAL TRAKTUS CERRAHİSİ

- **Sjöqvist (1938)**

Açık Cerrahi Traktotomi

-Postherpetik n.; Anestezi D.

- **White & Sweet (1942)**

Traktotomi- V, IX, X hiposetezi

- **Hitchcock (1970)**

Stereotaktik Perkutan RF Traktotomi

- **Schvarcz (1971)**

Perkutan Caudalis-Nucleotomy

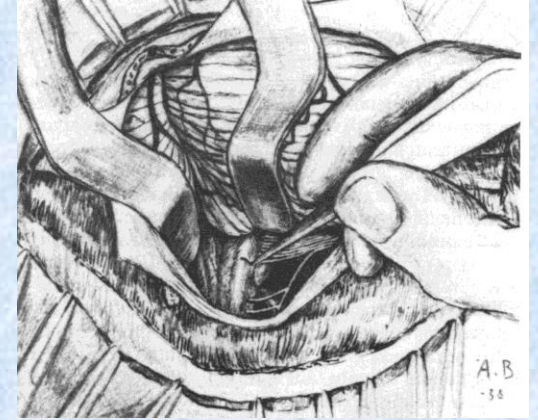
- **Nashold (1986)**

Açık Teknik-

Nucl. Caudalis DREZ Operation

- **Kanpolat (1989)-Ankara Üniversitesi**

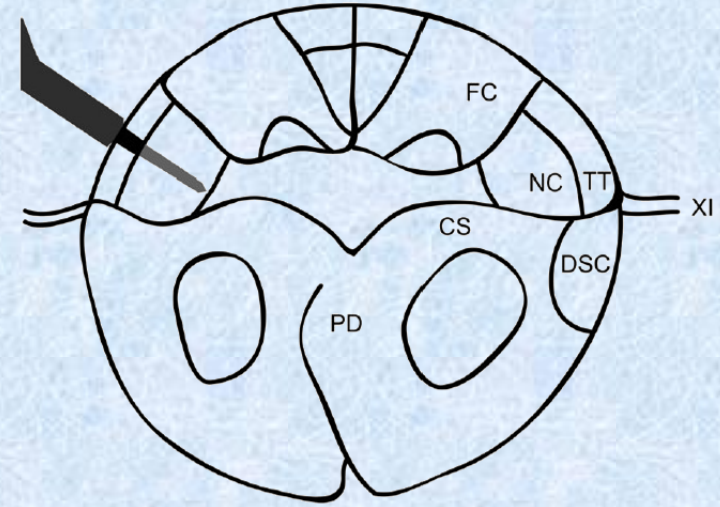
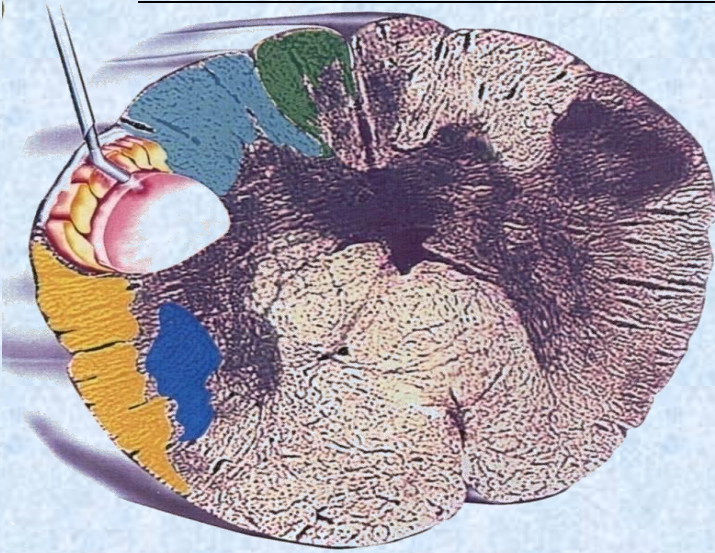
BT-eşliğinde Trigeminal Traktotomi-Nukleotomi





# TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ

## Perkutan Minimal İnvaziv Girişim



**Schvarcz:**

***“Primer olarak nukleus kaudalisin oral polünde sekonder düzendeki nöronlarda yapılan destruksiyona bağlı olarak kraniofasial ağrı geçebilir.”***



# BT-EŞLİĞİNDE PERKUTAN TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ

---

## ENDİKASYONLAR:

- Kraniofasial Malignite Ağrısı
  - Atipik Fasial Ağrı
  - Atipik veya “Failed” Trigeminal Nevralji
  - Post-travmatik fasial ağrı
  - Anestezi Doloroza
- 
- Vago-glossofaringeal Nevralji
  - Genikulat Nevralji

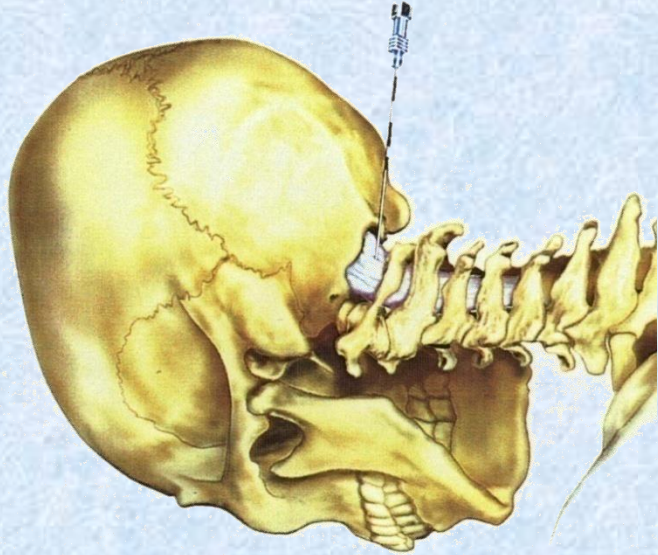




# BT-EŞLİĞİNDE TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ

TEKNİK VE UYGULAMA:

- 1- Koopere – Uyanık Hasta
- 2- LP- intratekal kontrast madde (iohexol) & BT’de prone pozisyon
- 4- Özel RF Kanpolat-elektrod kiti: KCTE, Radionics, Burlington
- 5- Posterior-paramedian C<sub>1</sub>-Occiput iğne girişi ve BT’de pozisyon



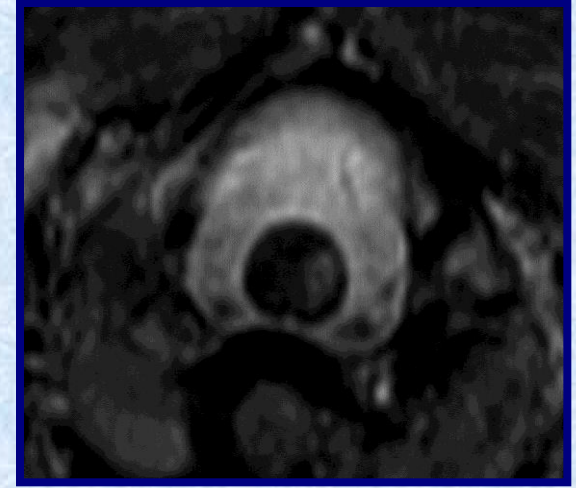
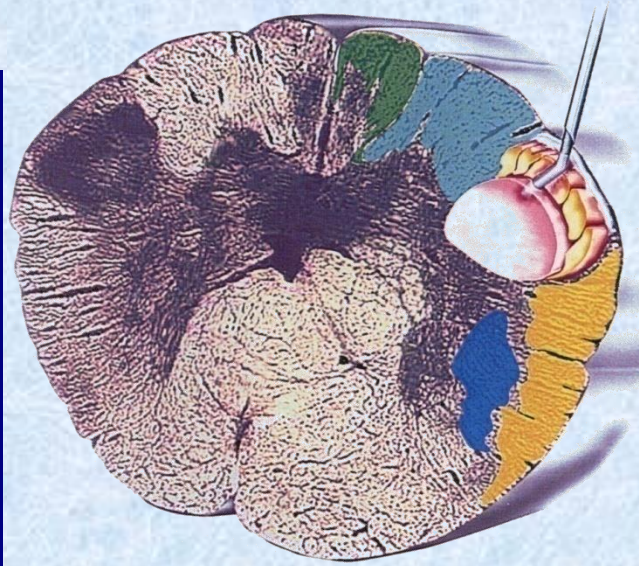




## BT-EŞLİĞİNDE TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ

TEKNİK VE UYGULAMA:

- 6- Elektrodun korda girişi, doku empedansı ve BT'de pozisyon
- 7- Elektriksel stimülasyon, fonksiyonel lokalizasyon ve RF termik lezyon (50-65° C)





ANKARA ÜNİVERSİTESİ TIP FAKÜLTESİ  
NÖROŞİRÜRJİ ANABİLİM DALI

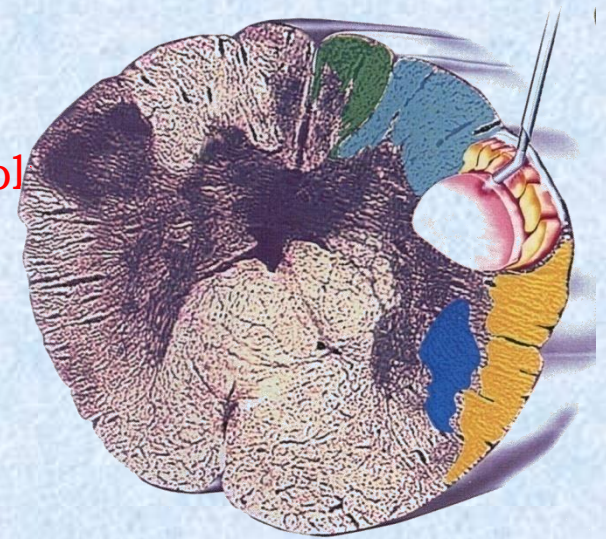
# SONUÇLAR

## PERKUTAN TRİGEMİNAL TRAKTOTOMİ-NUKLEOTOMİ:

- 44 Hasta – ortalama 70 ay takip
  - 10 Kraniofasial malignite ağrısı- %90
  - 10 Vago-glossofaringeal nevrалji-% 80
  - 4 Genikulat nevrалji- %100
  - 13 Atipik Fasial Ağrı %70 Ağrı Kontrol
  - 3 Failed Trigeminal Nevralji
  - 3 Postherpetik Nevralji
  - 1 Anestezi Doloroza

• **Total: %81 Ağrı Kontrolü**

• **Komplikasyon: Hafif geçici ataksi (%2)**

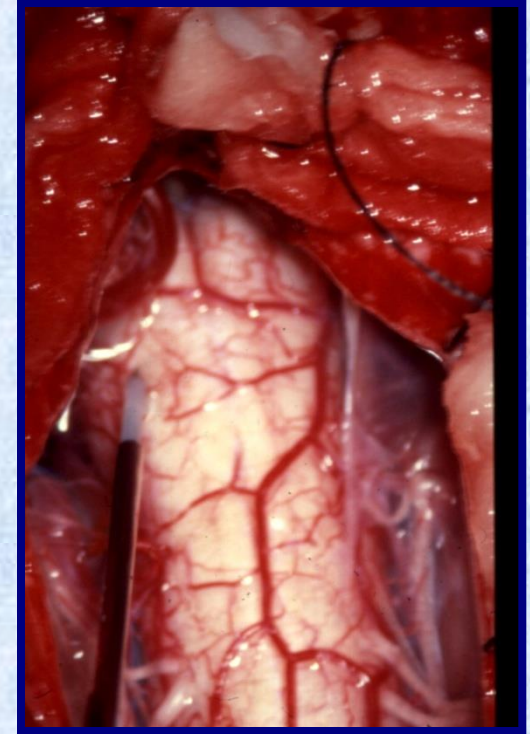


- Kanpolat Y, Savas A, Batay F, Sınay A: Computed Tomography-guided Trigeminal Tractotomy-Nucleotomy in the Management of Vagoglossopharyngeal and Genuiculate Neuralgias. Neurosurgery 43: 484-490, 1998
- Kanpolat Y, Savas A, Caglar S, Aydın V, Taşçıoğlu AB, Akyar S: CT-guided Percutaneous Tractotomy-Nucleotomy. Techniques in Neurosurgery 5: 244-251, 1999
- Kanpolat Y, Savas A, Ugur HC, Bozkurt M: The trigeminal tract and nucleus procedures in treatment of atypical facial pain. Surgical Neurology 64, 96-101, 2005



# NUCLEUS CAUDALIS DORSAL ROOT ENTRY ZONE OPERATION (TRIGEMINAL DREZ AMELİYATI)

- Açık Cerrahi- Daha geniş destruksiyon
- Seri Trigeminal Nucleus Caudalis RF Lezyonu
- ENDİKASYON:
  - 1- Anestezi Doloroza
  - 2- Diğer TR-NC endikasyonları
- TEKNİK
  - 1- Genel Anestezi-prone pozisyon
  - 2- Kraniektomi + Laminektomi
  - 3- Mikronöroşirürji ve Seri RF lezyonları  
(75° C x 20 sn)
  - 4- C<sub>2</sub> dorsal root → Spinal aksesör;  
obex üstü (5 mm)

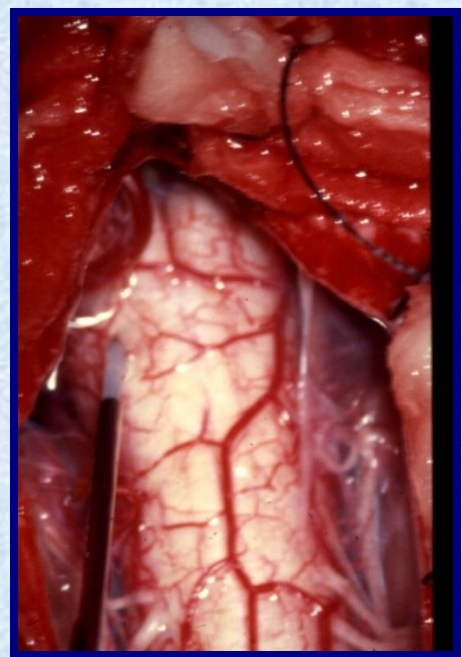
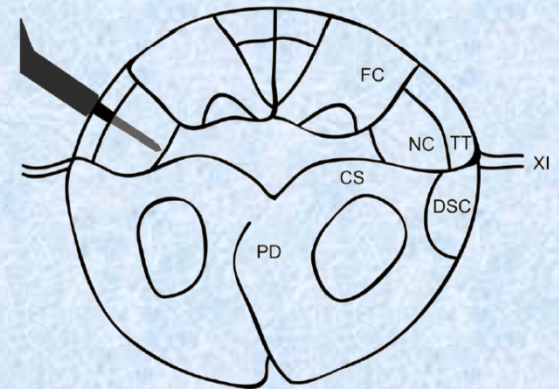
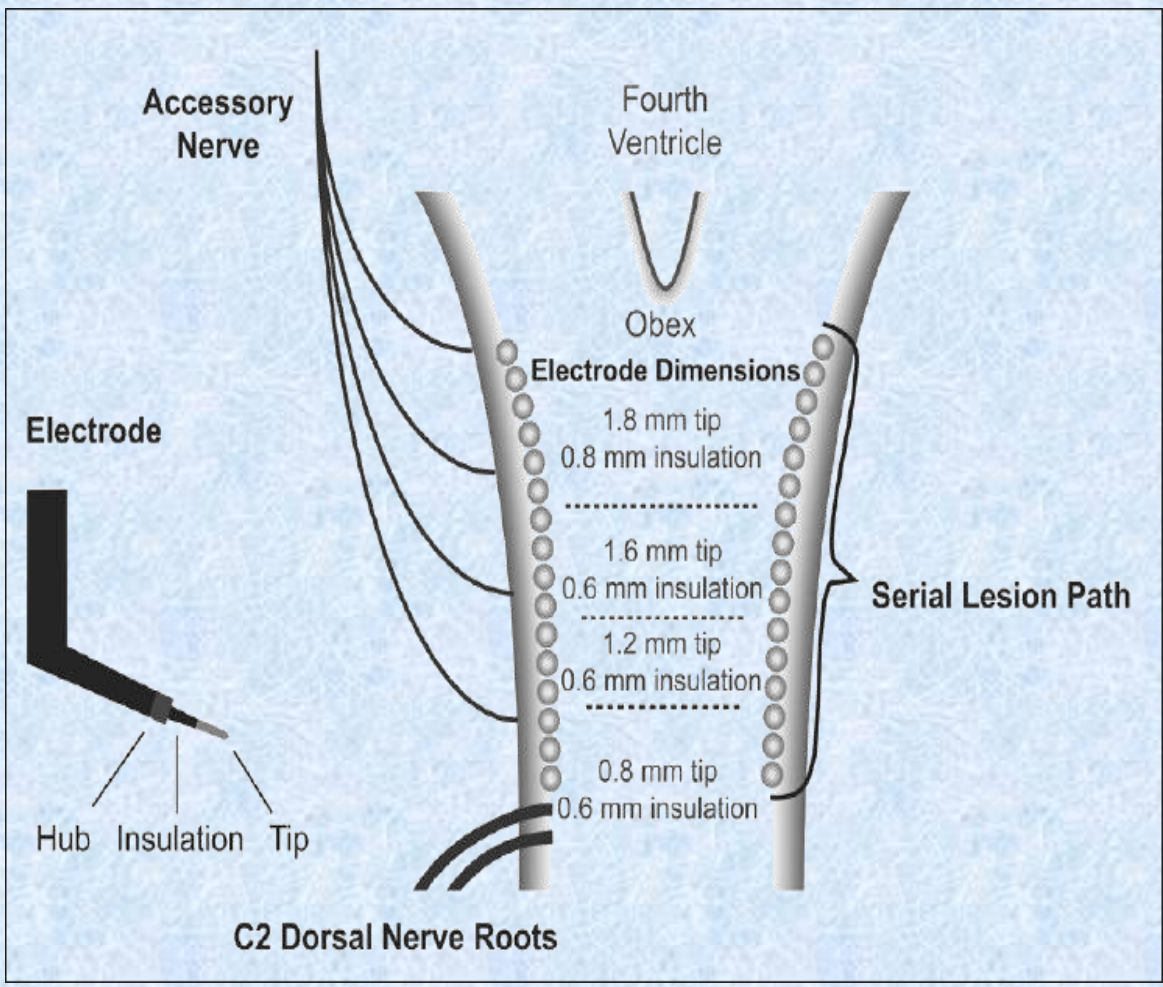


## KOMPLİKASYON

Ataksi; Motor ve duyu def.; Genel nöroşirürjikal komplikasyonlar

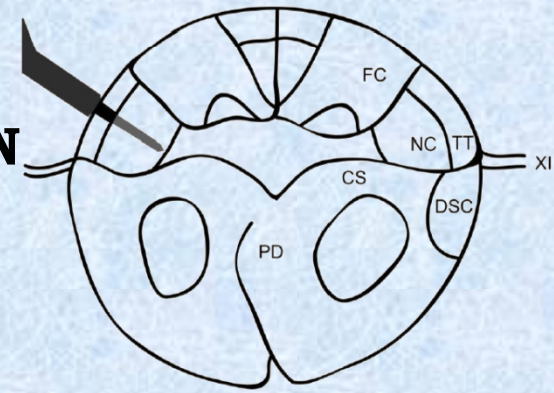


# NUCLEUS CAUDALIS DORSAL ROOT ENTRY ZONE OPERATION (TRIGEMINAL DREZ AMELİYATI)





# **NUCLEUS CAUDALIS DORSAL ROOT ENTRY ZONE OPERATION (TRIGEMINAL DREZ AMELİYATI)**

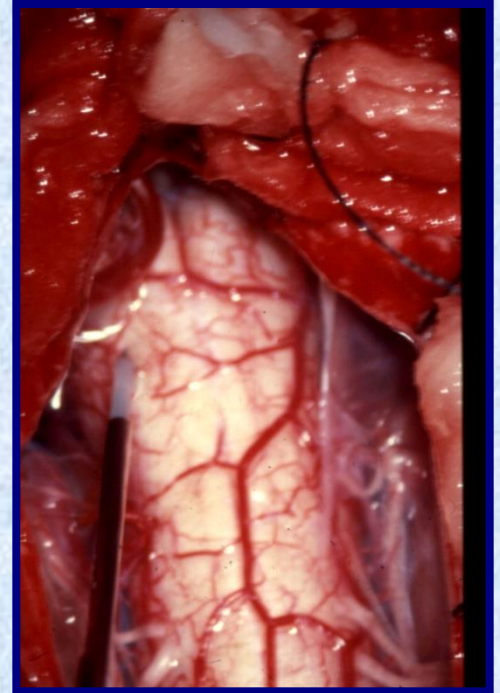




# SONUÇLAR

## TRİGEMİNAL DREZ AMELİYATI:

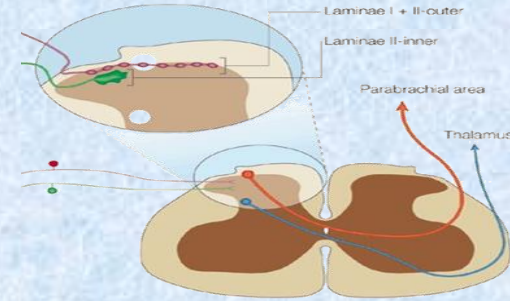
- 26 Hasta:
  - 8 Anestesia Dolorosa
  - 4 Atipik Fasial Ağrı (daha önce TR-NC yapılan)
  - 4 Failed Trigeminal Nevralji
  - 4 Kraniofasial Malignite
  - 2 Genikulat nevralsi
- Ağrı Kontrolü: % 76
- Komplikasyon: 8 hasta
  - Kalıcı ataksi (4 hasta)
  - Geçici ataksi, parezi (2)
  - hemi-hipoestezi (2)





# SPİNAL (SERVİKAL VEYA LOMBER) DORSAL ROOT ENTRY ZONE (DREZ) OPERATION

- Açık Cerrahi-
- Nöropatik ağrı & spastisite



- ENDİKASYON:

1- Brakial pleksus lezyonları

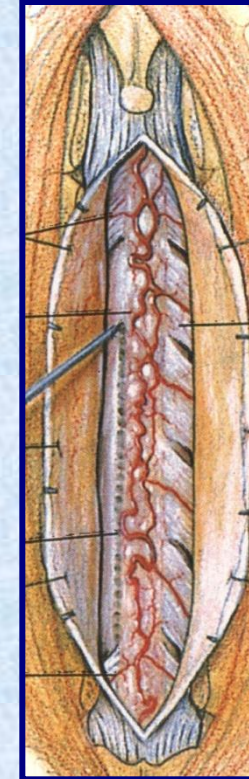
2- Kök avulsiyonu

3- Postherpetik ağrı

4- Amputasyon, fantom, periferik sinir

5- Kanser ağrısı (nöropatik)

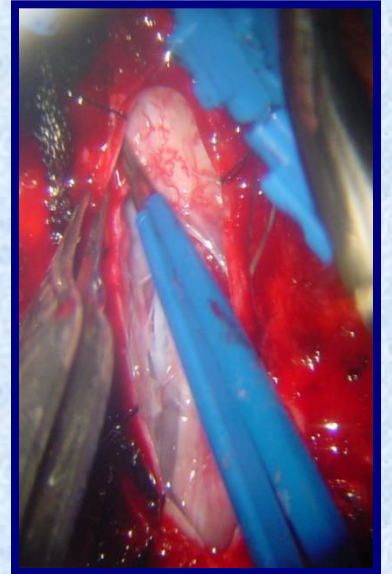
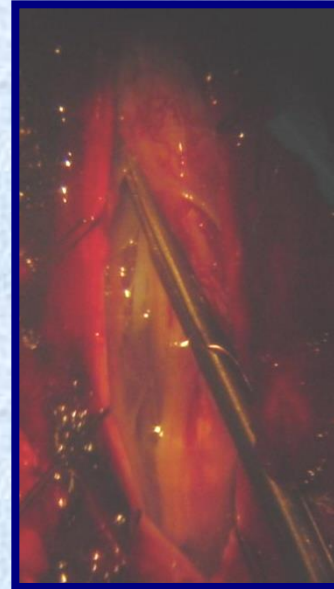
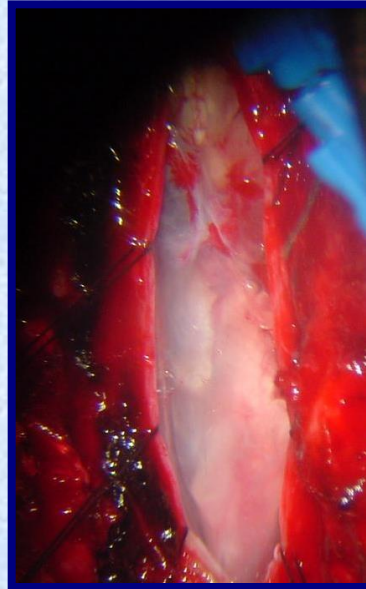
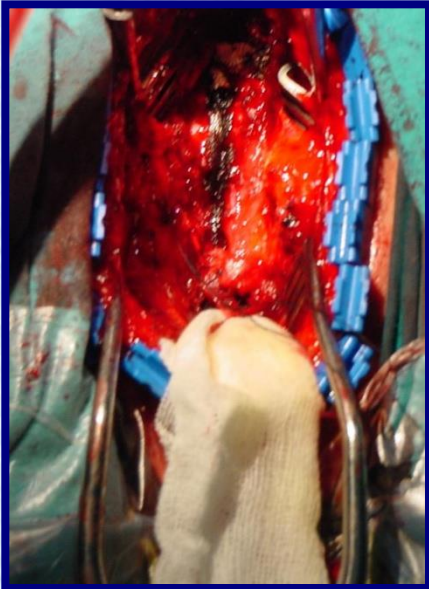
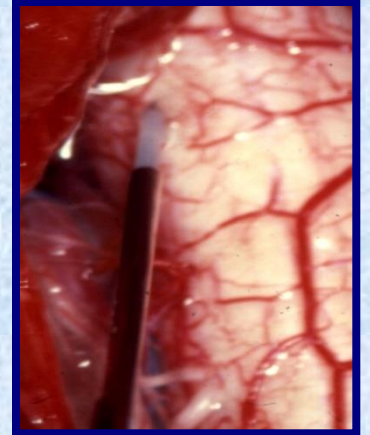
6- Spinal kord lezyonları





# SPİNAL DORSAL ROOT ENTRY ZONE (DREZ) OPERATION

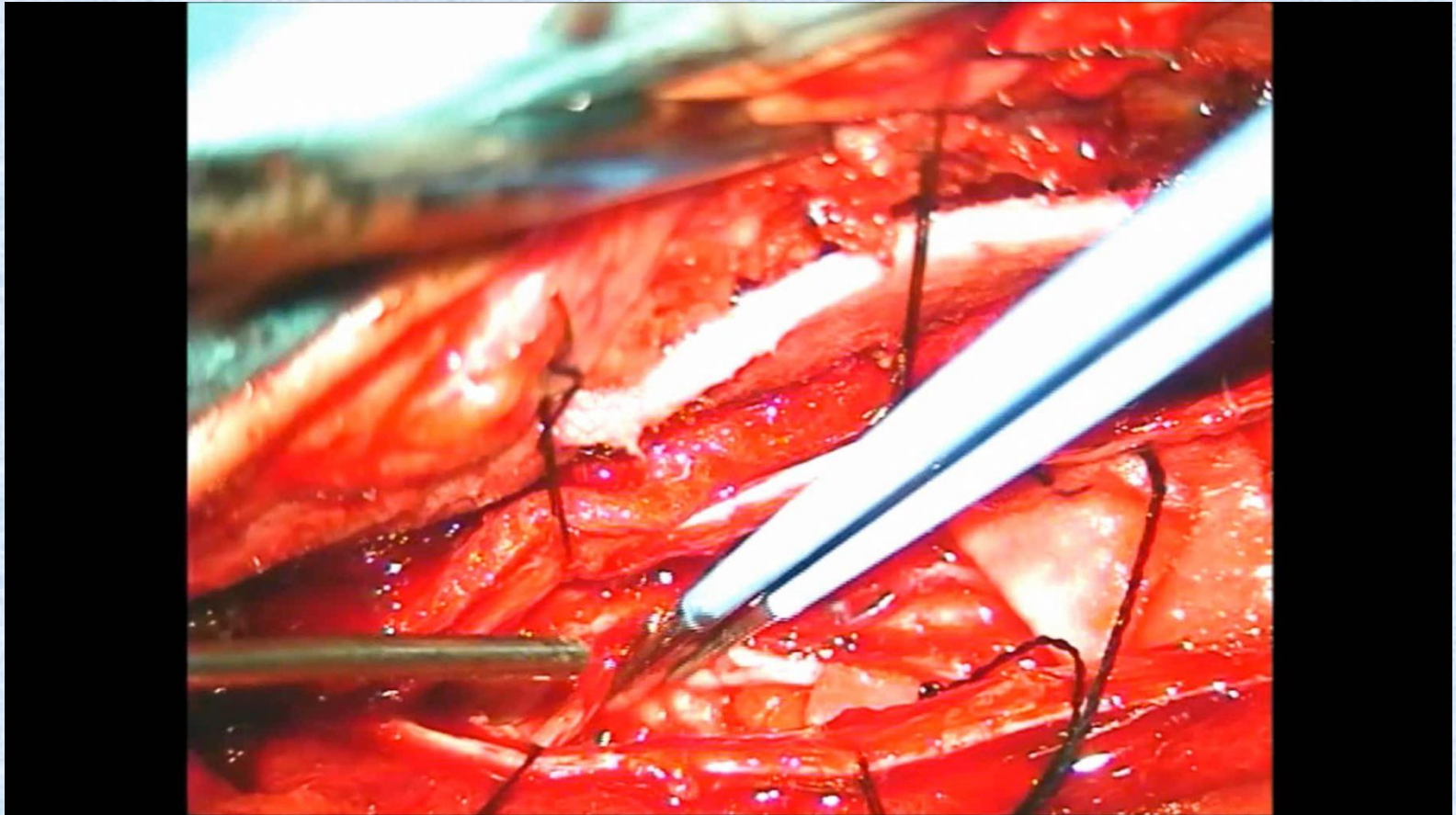
- **TEKNİK**
  - 1- Genel Anestezi-prone pozisyon
  - 2- Hemilaminektomi
  - 3- Mikronöroşirürji veya Seri RF lezyonları  
(70° C x 20 sn)
  - 4- DREZ- seri lezyon







# **SPINAL DORSAL ROOT ENTRY ZONE (DREZ) OPERATION**





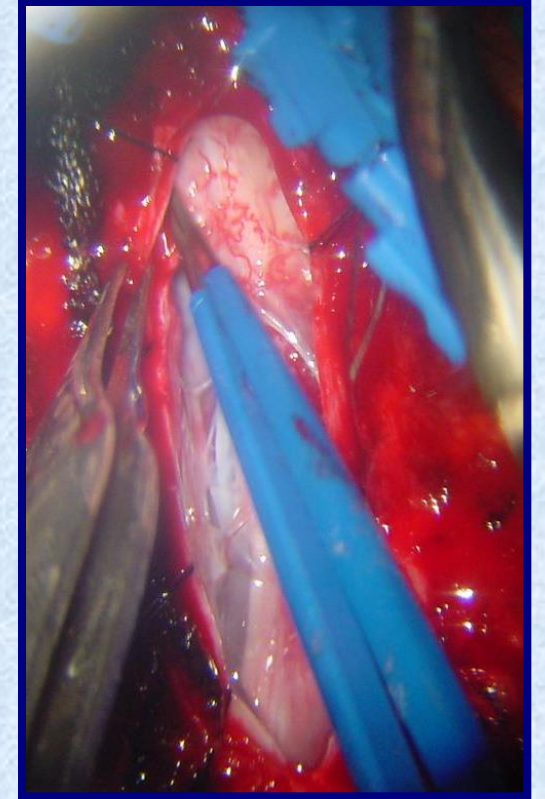
# SPİNAL DORSAL ROOT ENTRY ZONE (DREZ) OPERATION SONUÇLAR

(32 Hasta)

- **7 Brakial pleksus avulsiyonu (6)**
- **8 Ca.- brakial pleksus nöropatisi (6)**
- **13 spinal kord lezyonu (11)**
- **2 idiyomatik nöropatik ağrı**
- **2 servikal medüller travma**

## **Komplikasyon:**

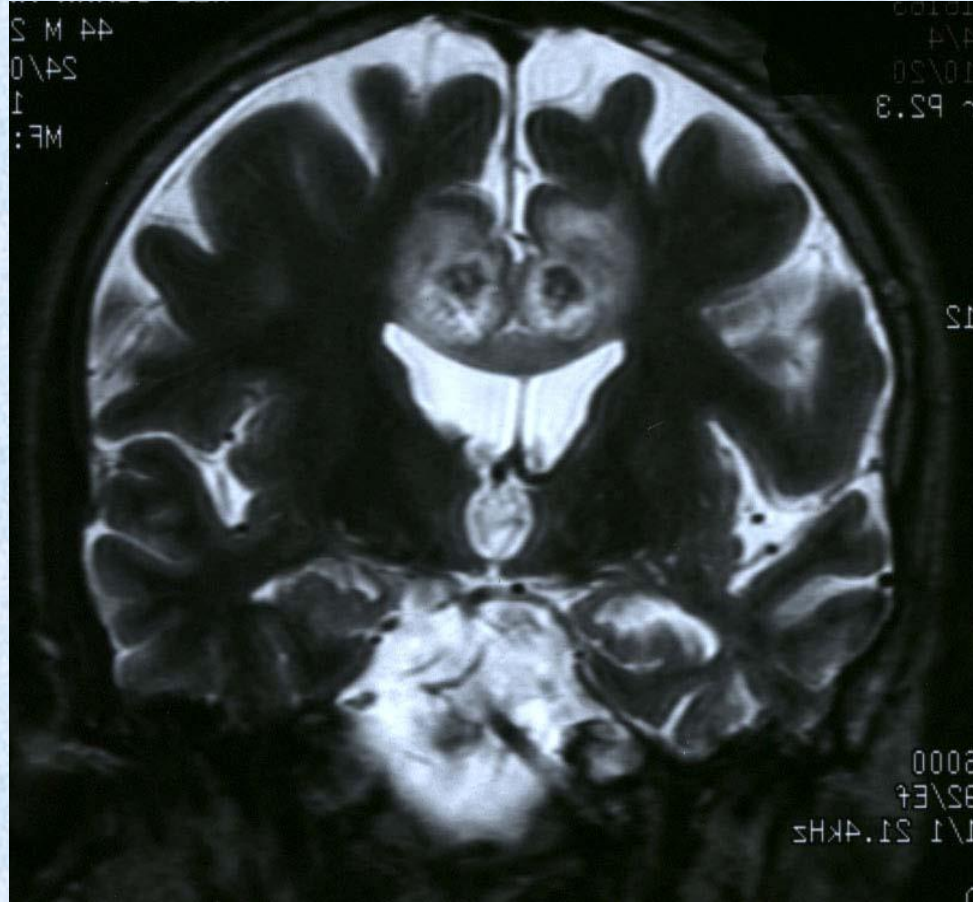
- **1 quadriparezide artış**
- **4 geçici hafif parezi**
- **3 geçici hafif ataksi**
- **2 hemihipoestezi**





# AĞRININ CERRAHİ TEDAVİSİ

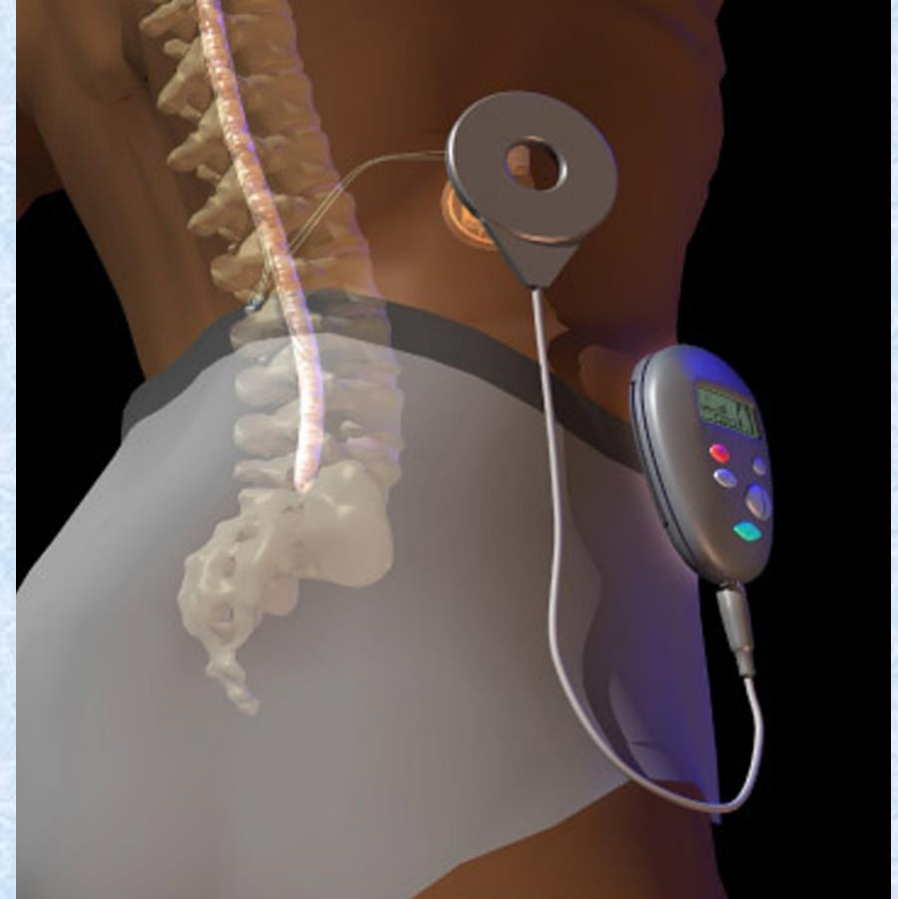
**STEREOTAKTİK SİNGULOTOMİ- 10 Hasta- % 70 tatminkar ağrı kontrolü**





# (SPİNAL) DORSAL COLUMN STIMULATION

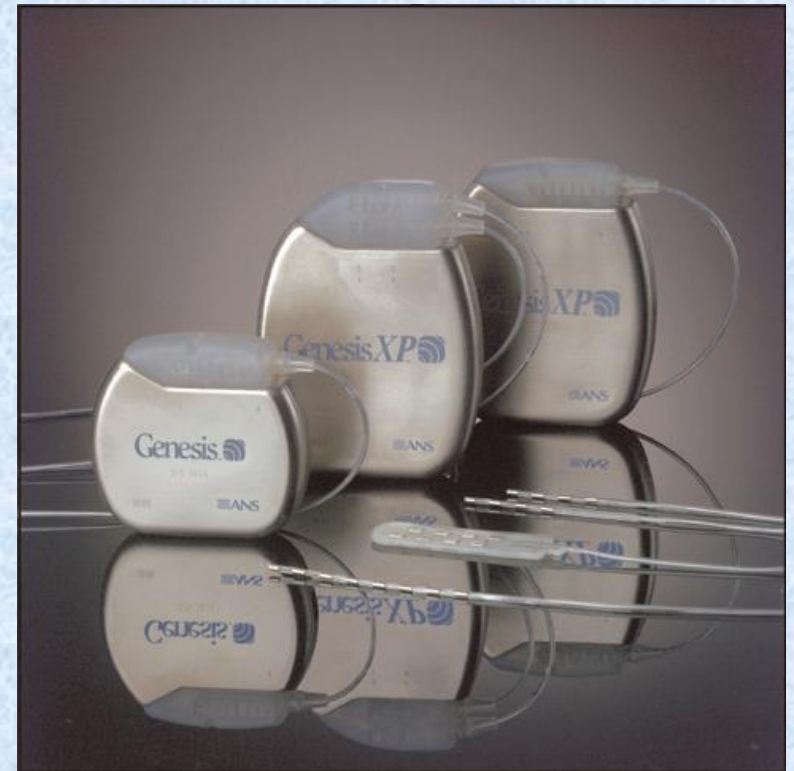
- Neurostimulation
- **Psikolojik değerlendirme**
  
- **ENDİKASYON:**
  - 1- **Failed-back**
  - 2- Nöropatik ağrı
  - 3- Meduller lezyon sonrası
  - 4- Fantom & sinir lezyon ağrıları
  - 5- Kardiojenik ağrı
  - 6- Diğer ağrı tipleri...





# (SPINAL) DORSAL COLUMN STIMULATION

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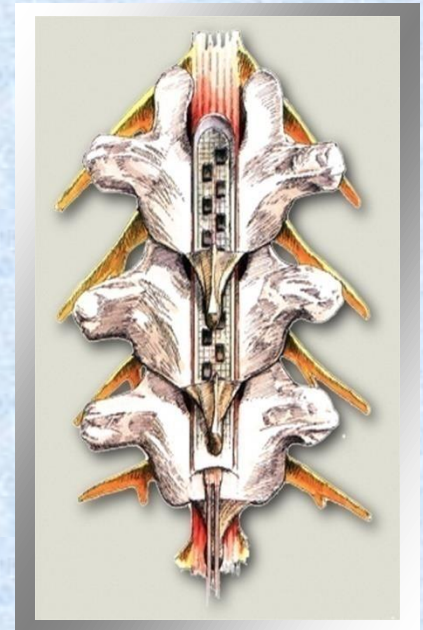
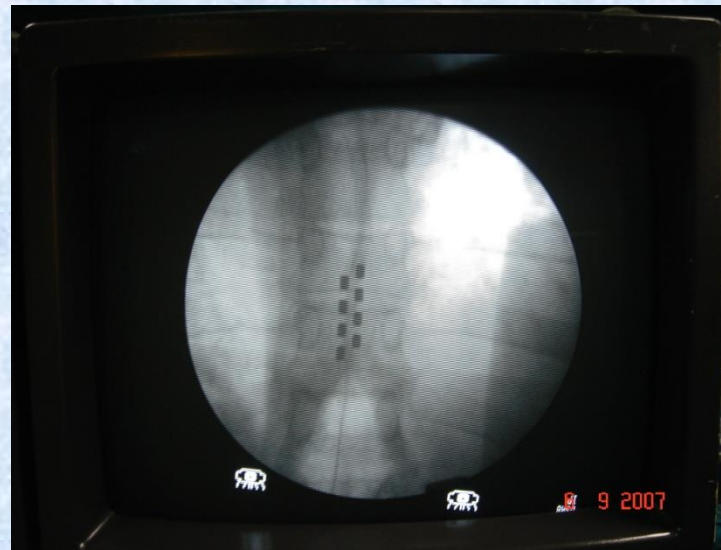
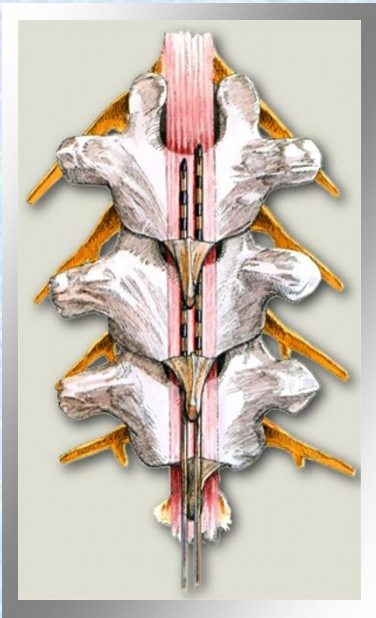


© Medtronic, Inc. 2008



# (SPINAL) DORSAL COLUMN STIMULATION

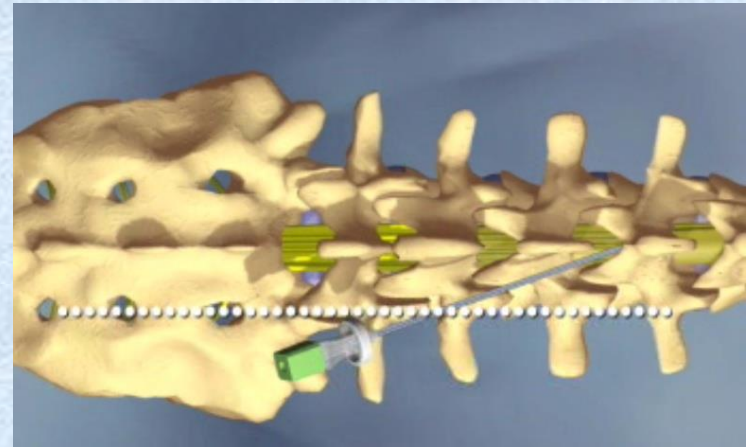
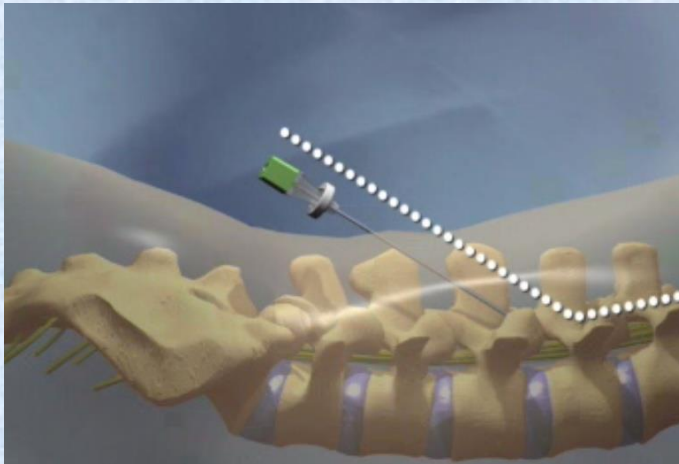
Percutaneous vs. Laminotomy type





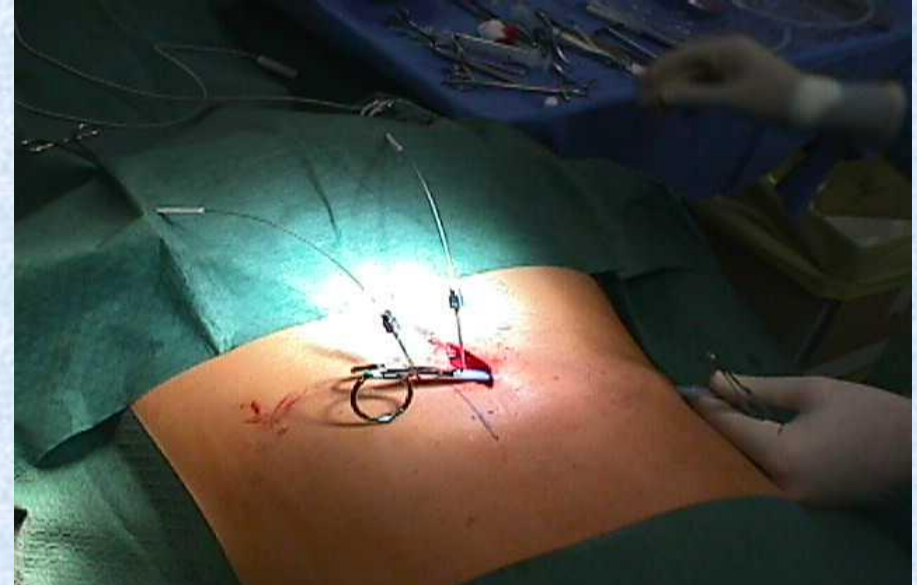
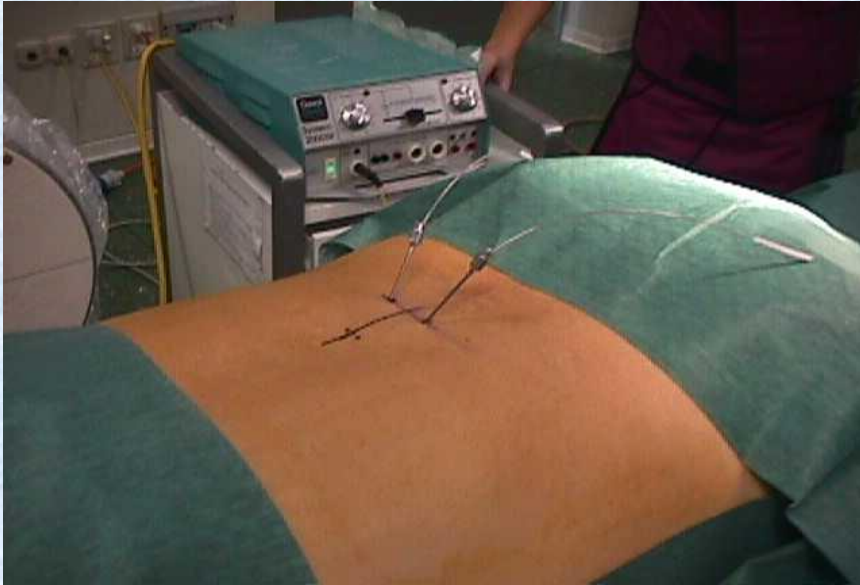
# (SPINAL) DORSAL COLUMN STIMULATION Percutaneous

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# (SPINAL) DORSAL COLUMN STIMULATION Percutaneous



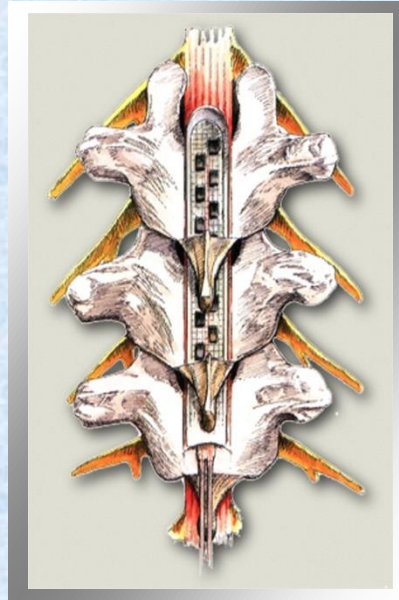




## (SPINAL) DORSAL COLUMN STIMULATION

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Laminotomy tipi:  
Daha etkili & daha az komplikasyon

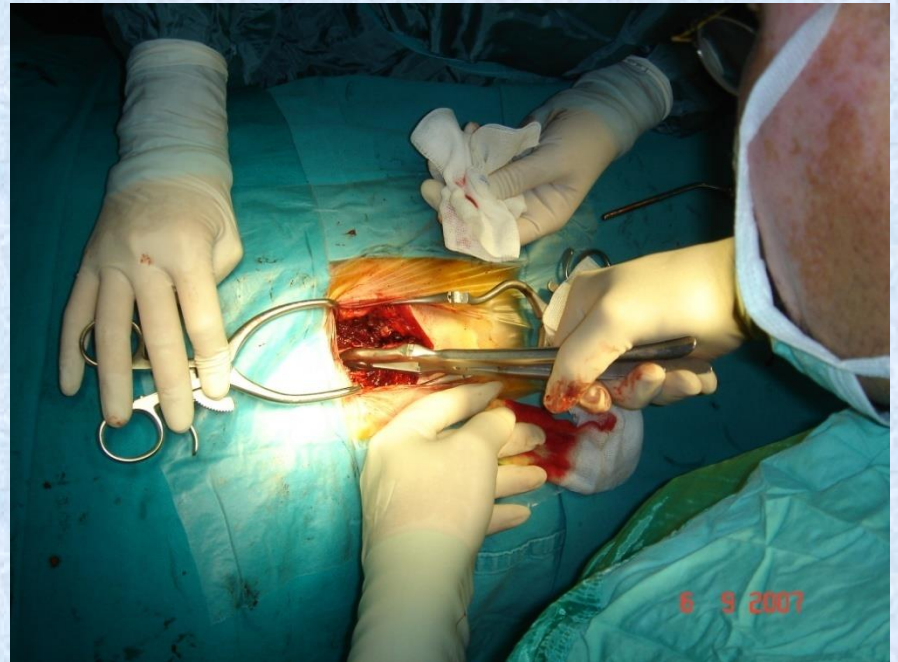
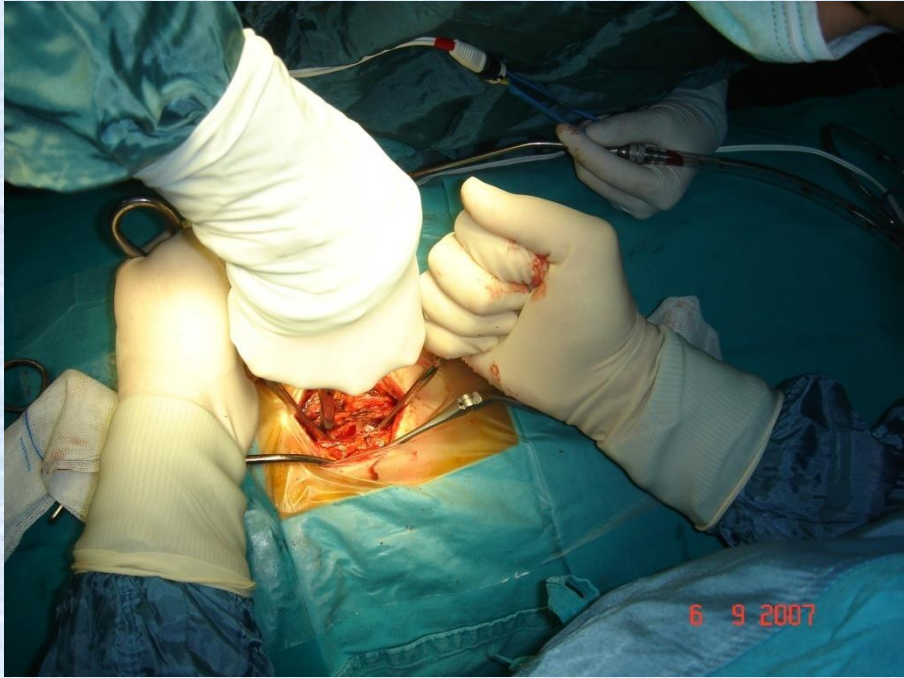


North RB, Kidd DH, Petrucci L, Dorsi MJ: Spinal cord stimulation electrode design: A prospective, randomized, controlled trial comparing percutaneous with laminectomy electrodes: Part II-clinical outcomes. Neurosurgery 57: 990-996, 2005



# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

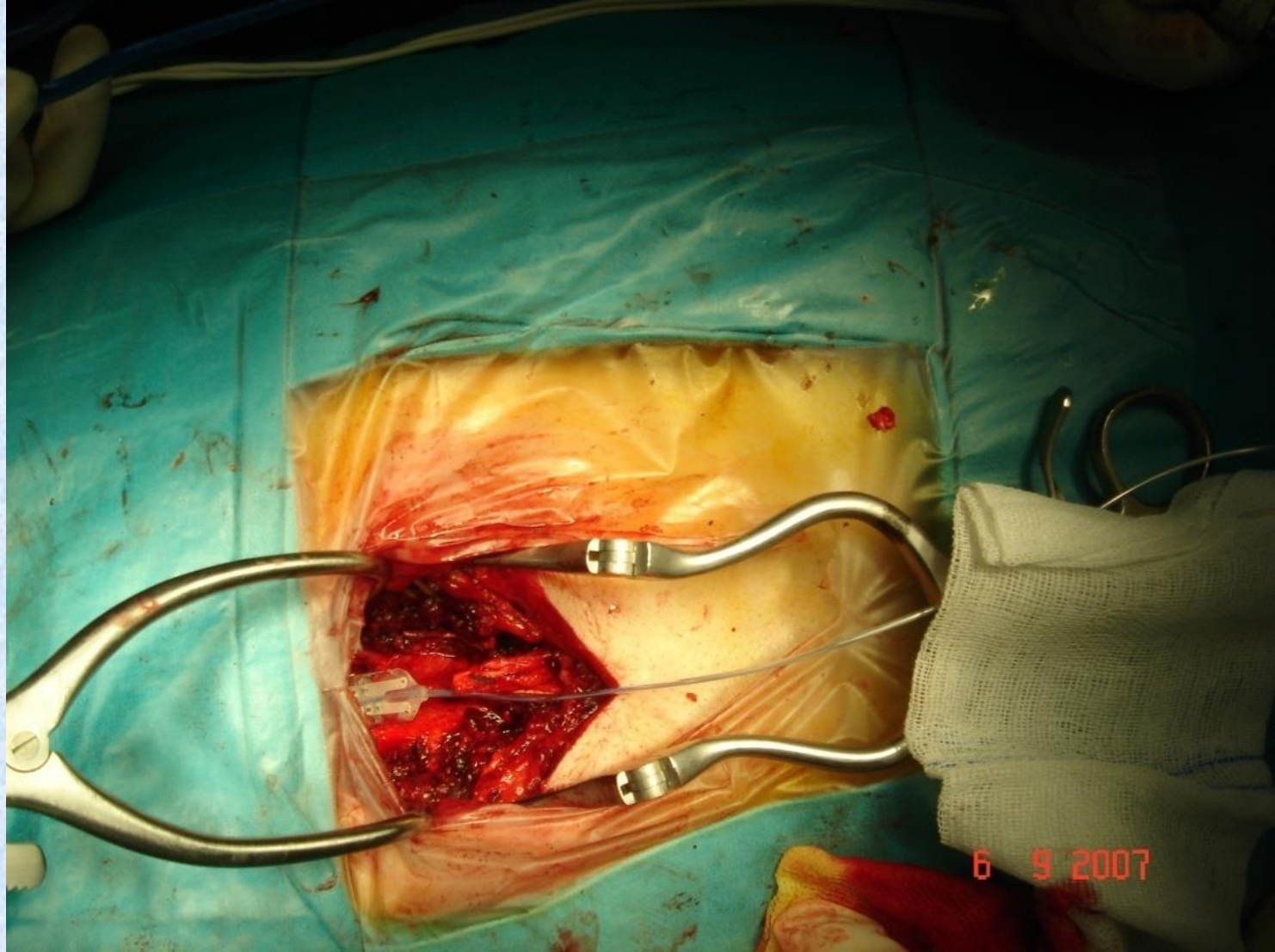
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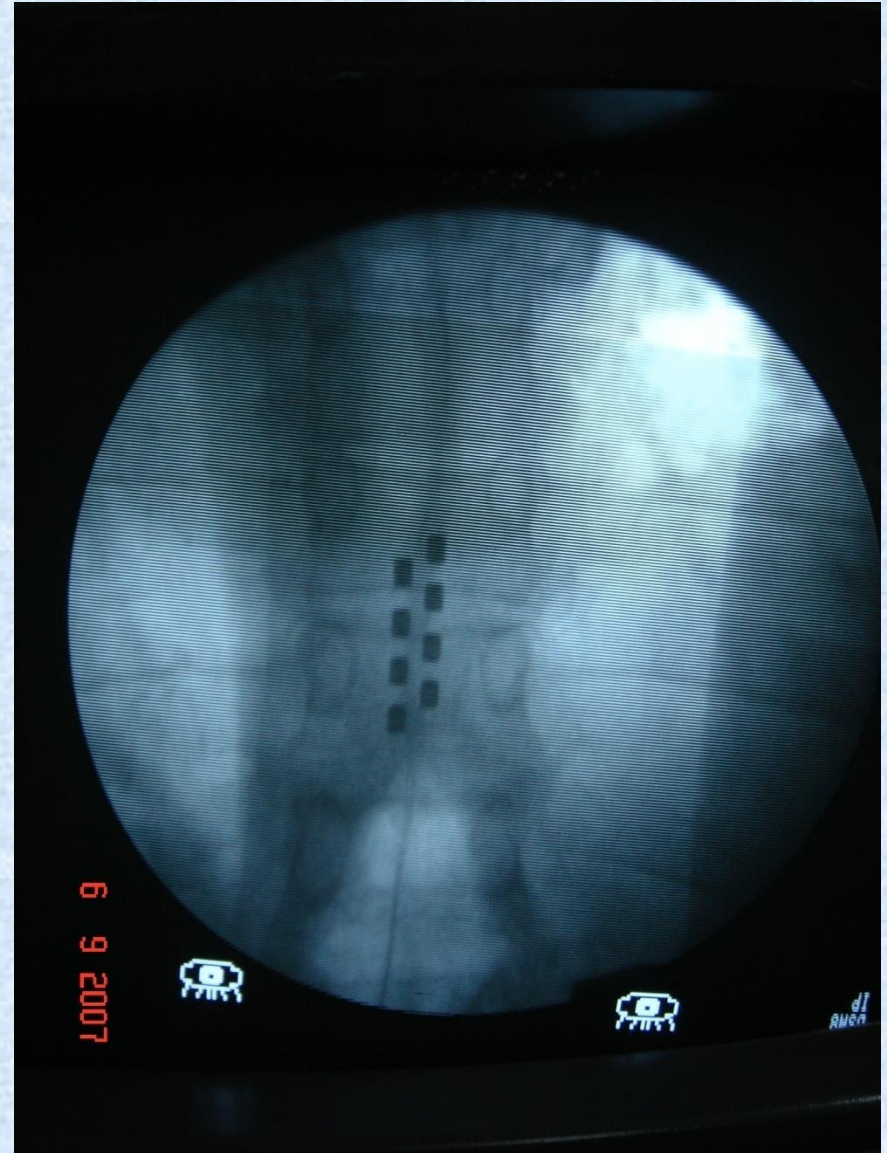
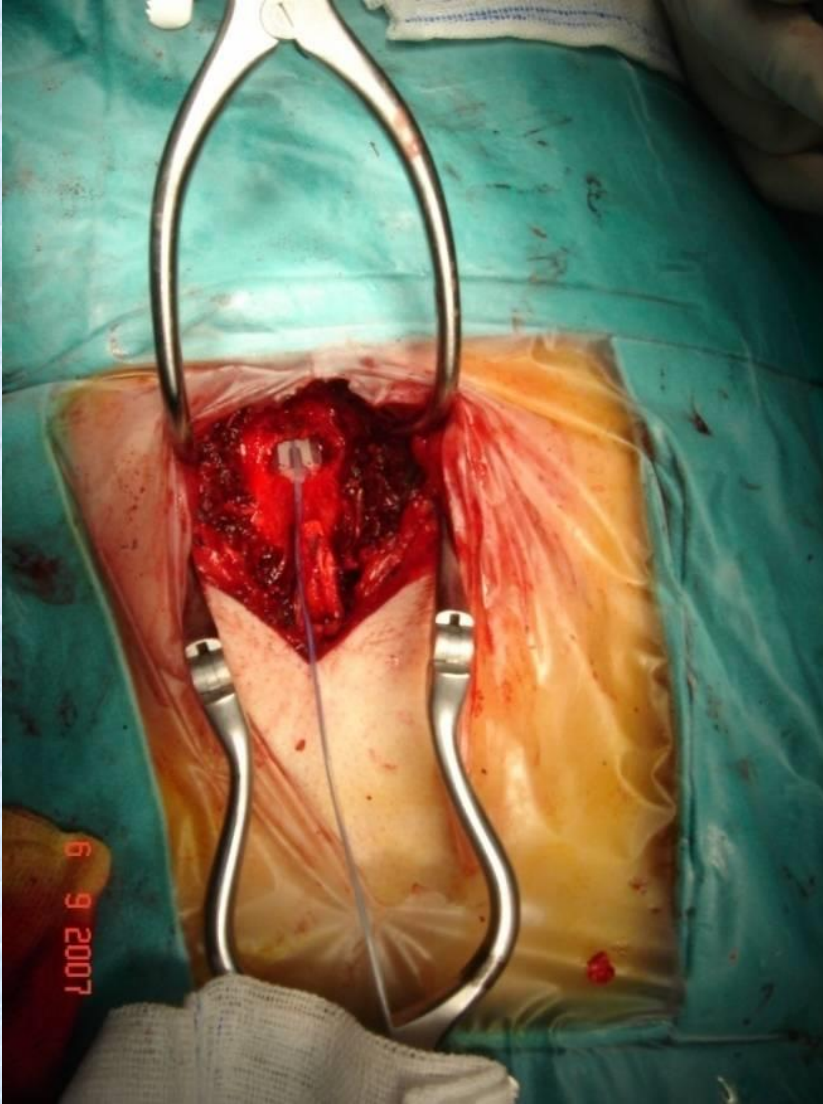
# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

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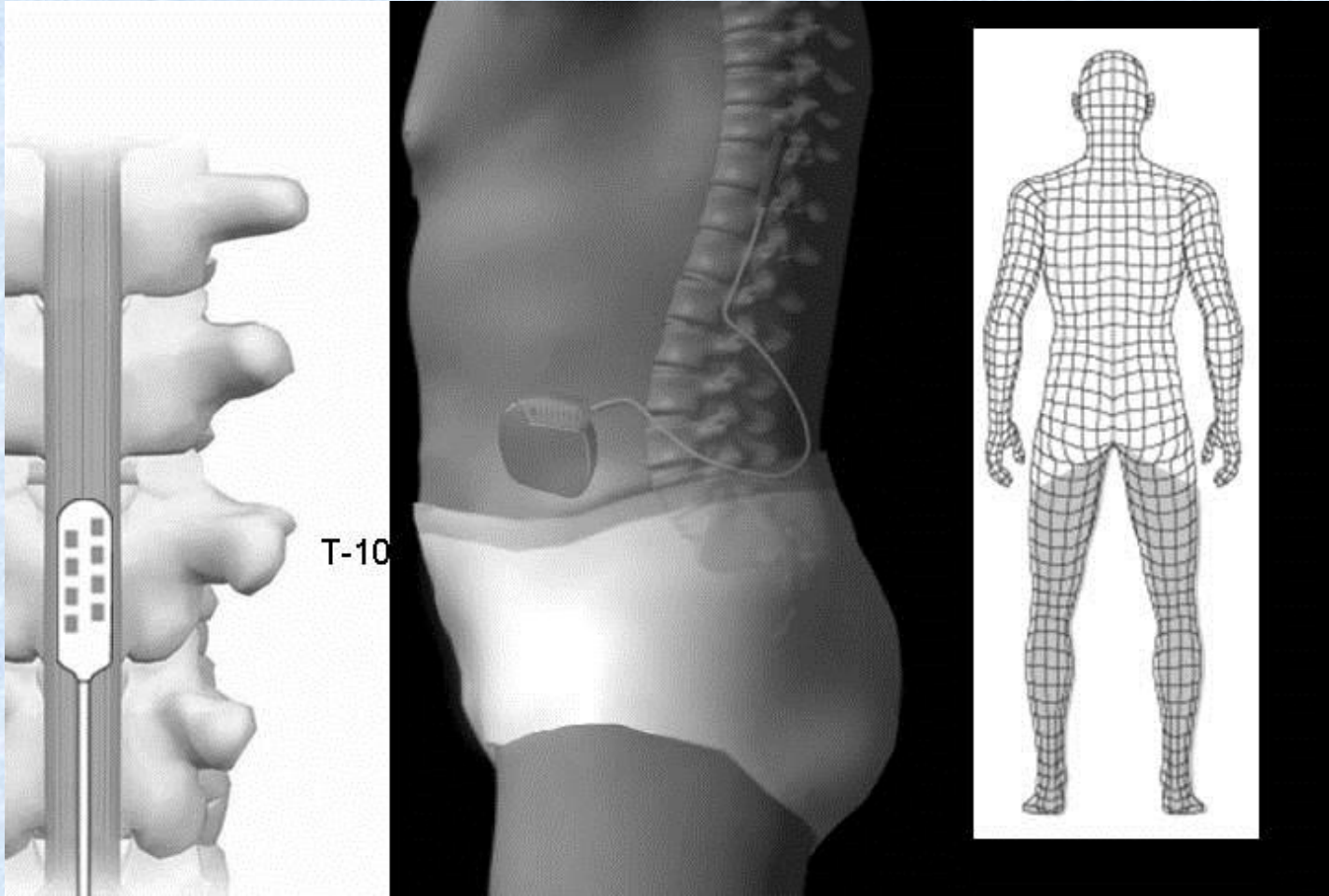
# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik





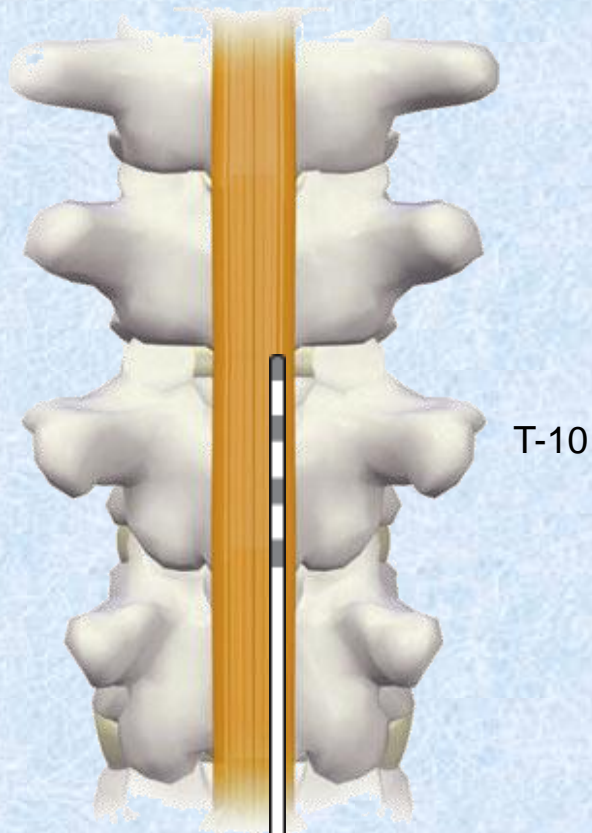
# (SPINAL) DORSAL COLUMN STIMULATION Test stimulasyon

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# Unilateral Leg

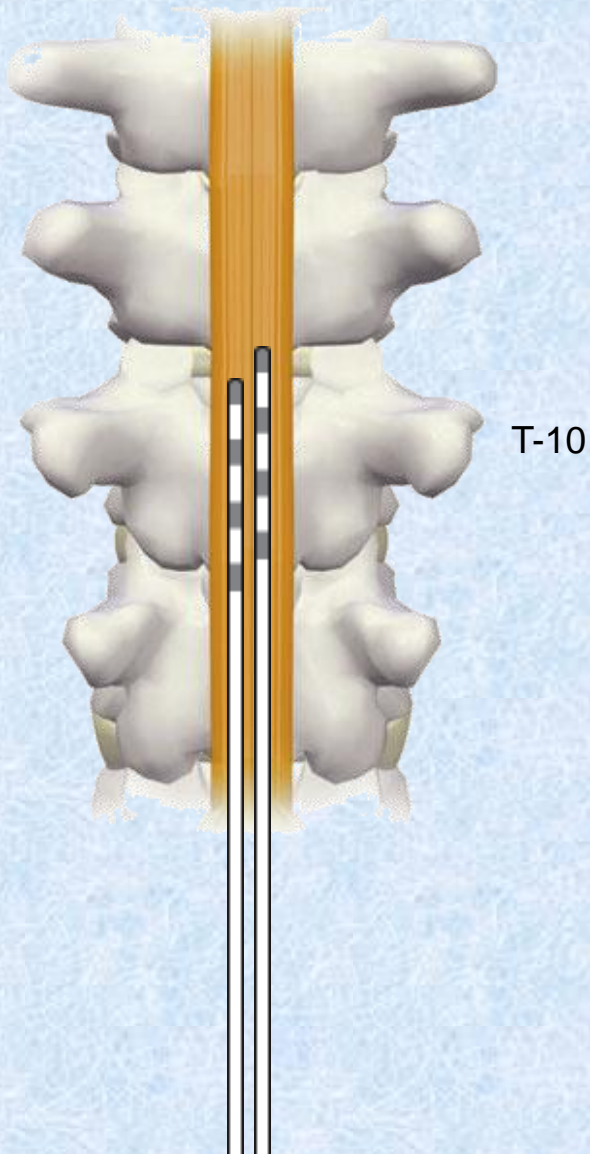
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Unilateral Leg

# Bilateral Leg

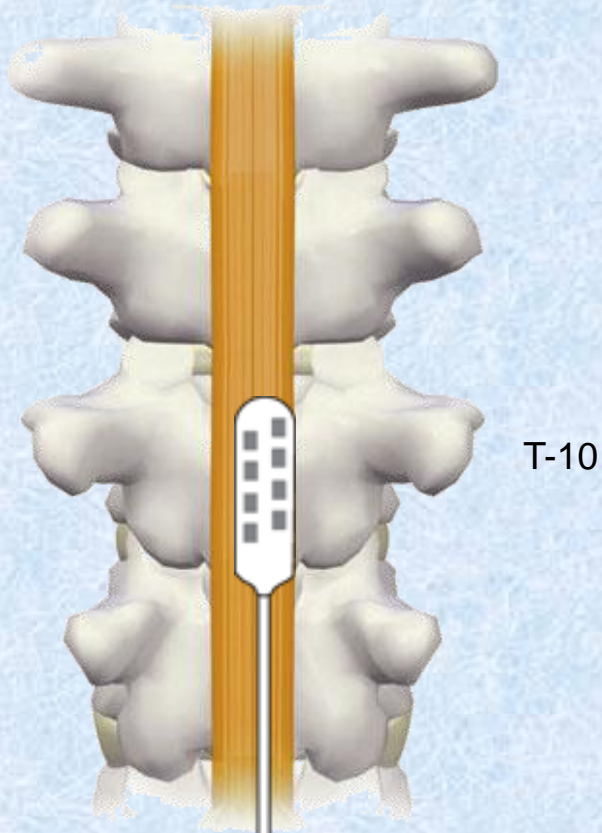
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Bilateral Leg

# Bilateral Leg

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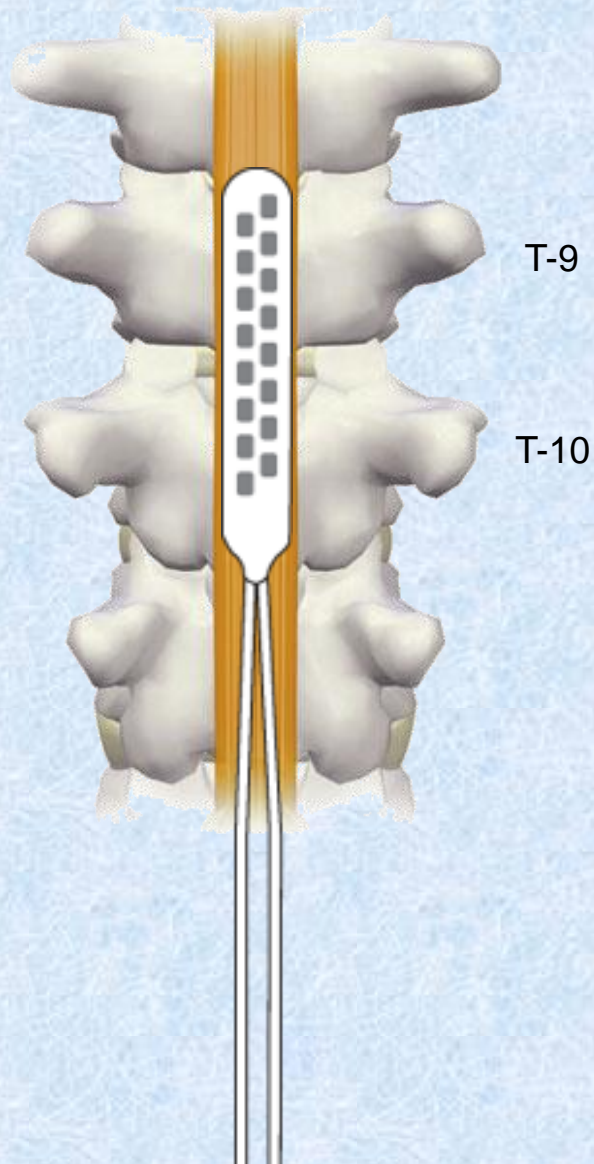


Bilateral Leg



# Bilateral Leg and Low Back

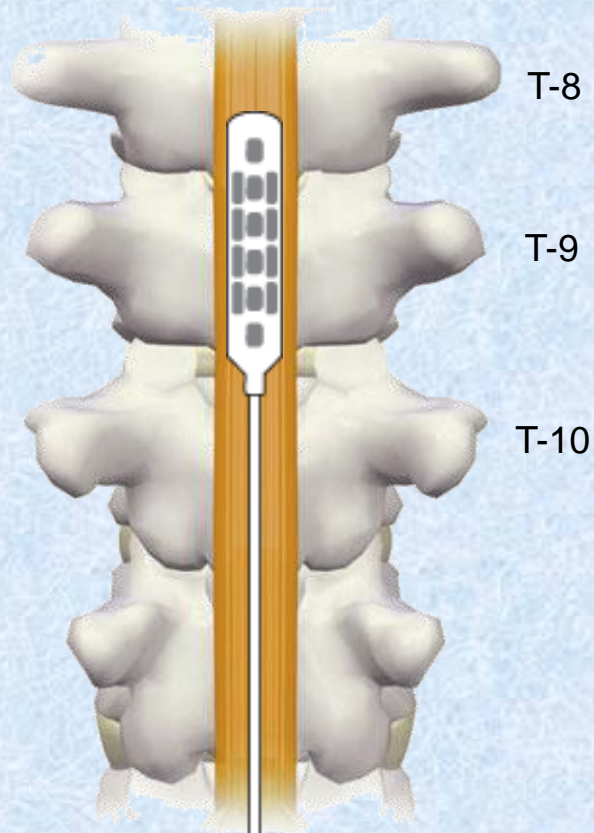
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Bilateral Leg and Low Back

# Bilateral Leg and Back

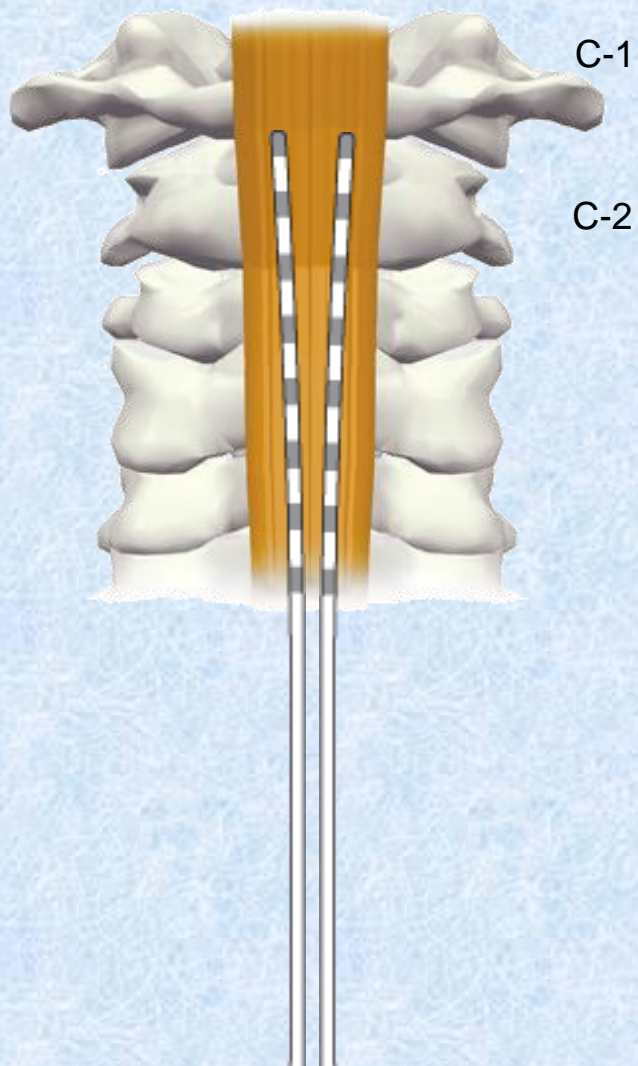
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Bilateral Leg and Back

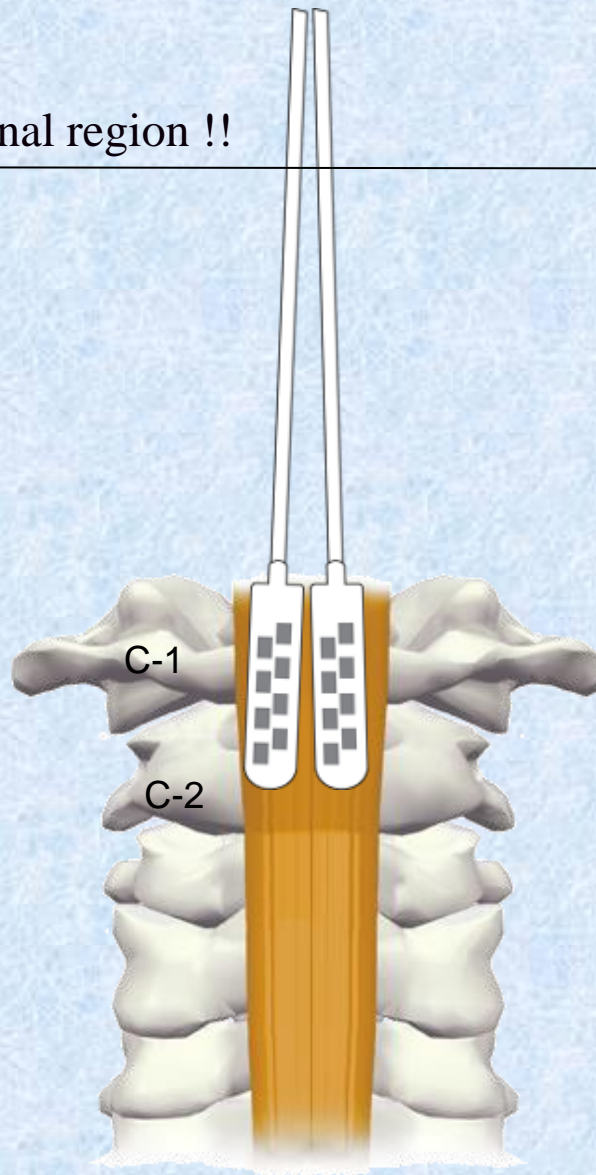
# Bilateral Arm and Shoulder

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Bilateral Arm and Shoulder

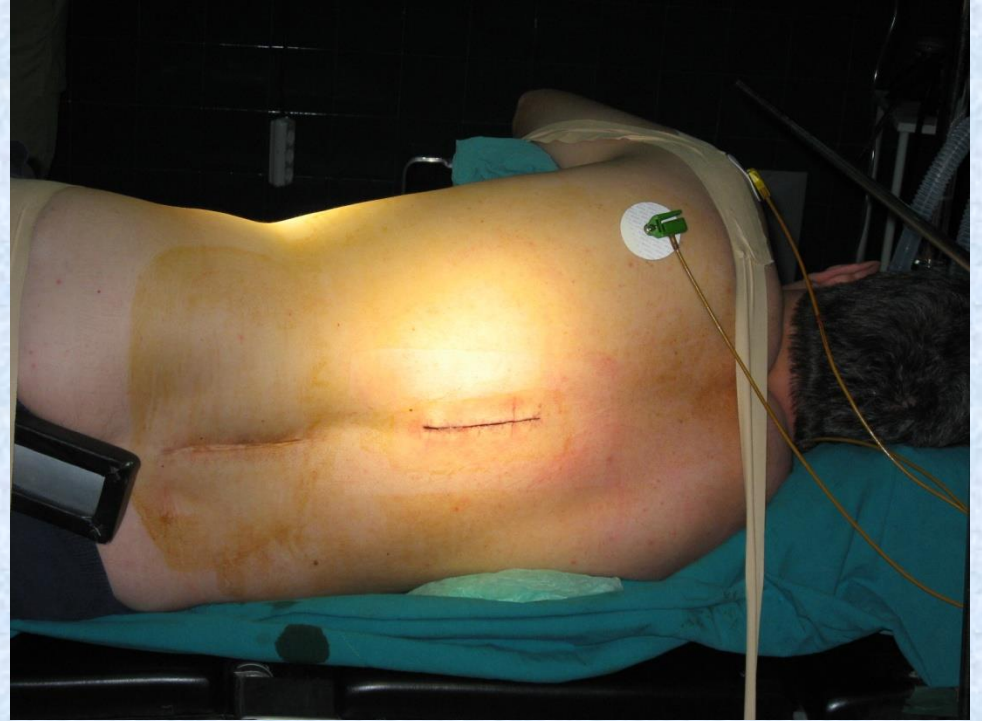
Nucleus caudalis- Trigeminal region !!





# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

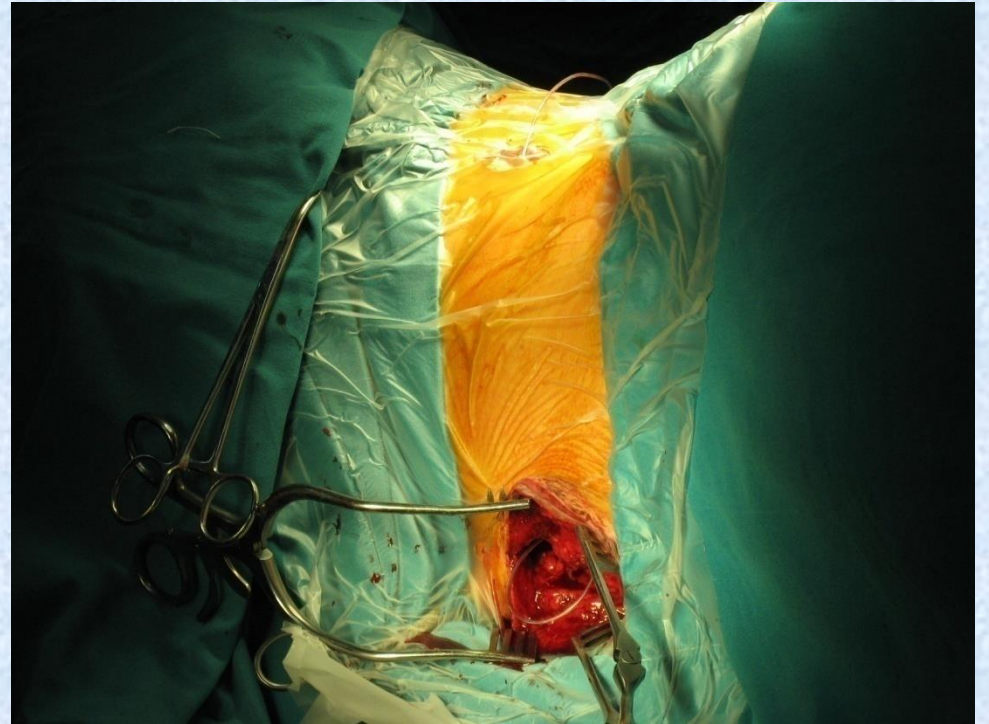
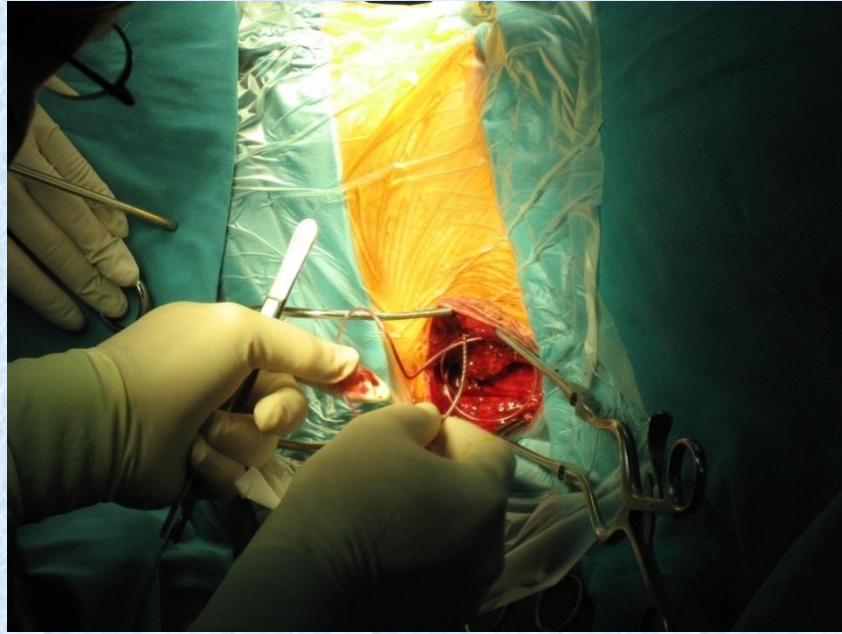
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# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

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# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

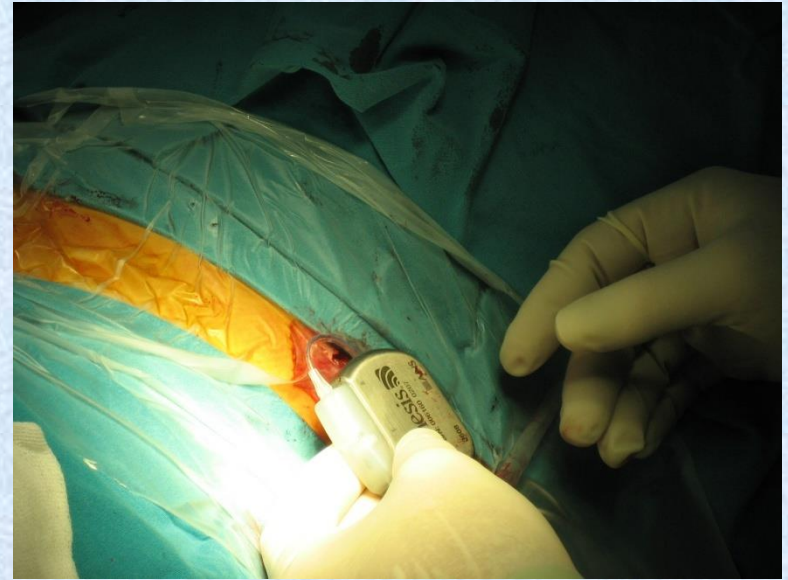
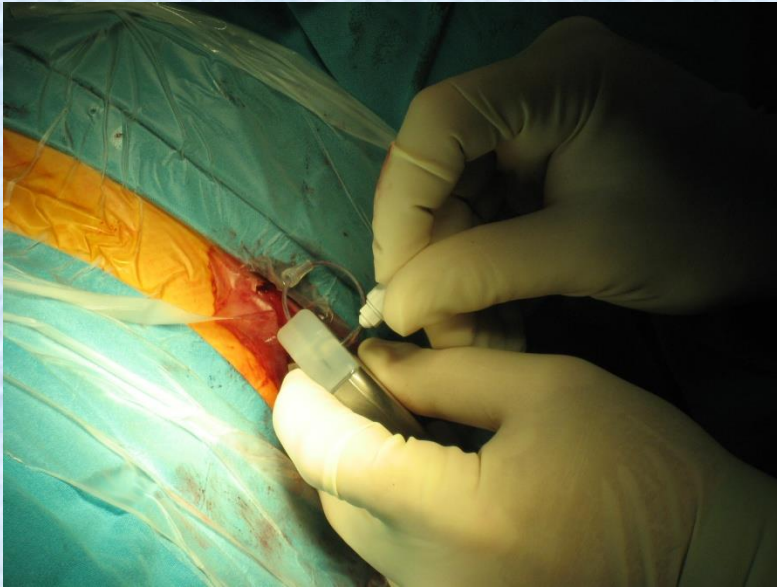
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# (SPINAL) DORSAL COLUMN STIMULATION Cerrahi Teknik

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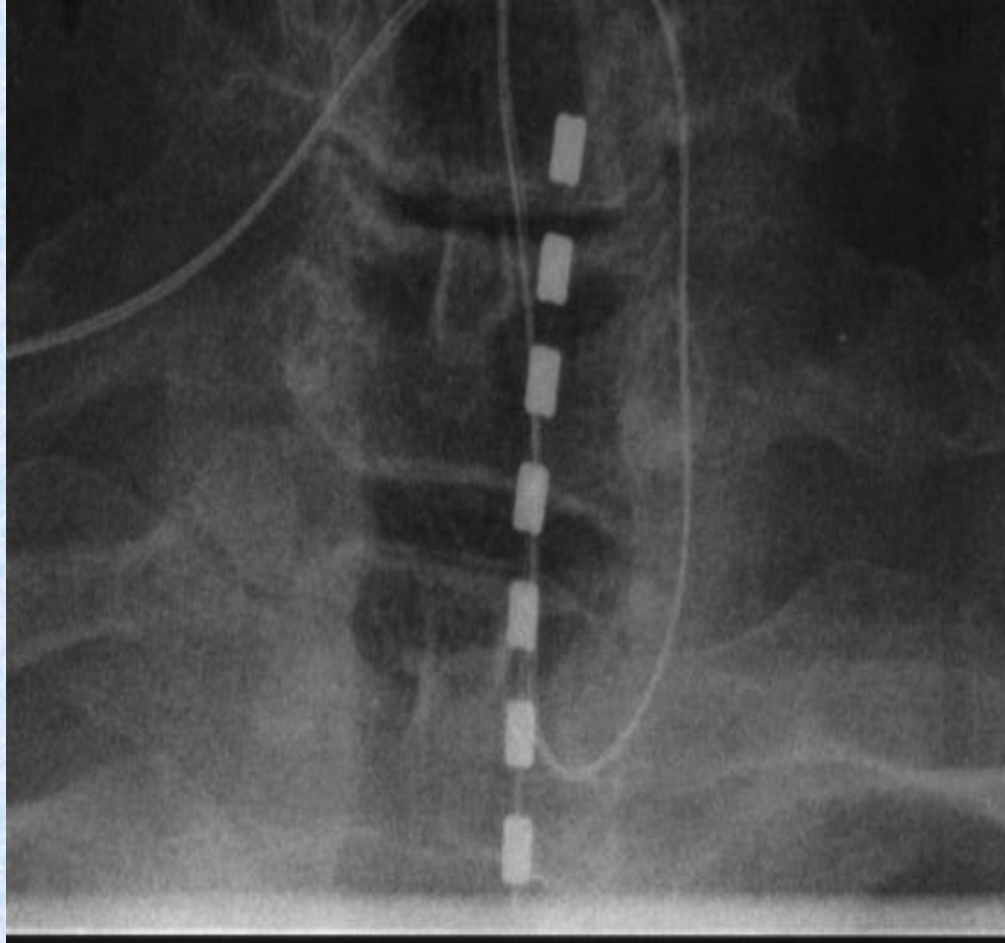




# (SERVİKAL) DORSAL COLUMN STIMULATION

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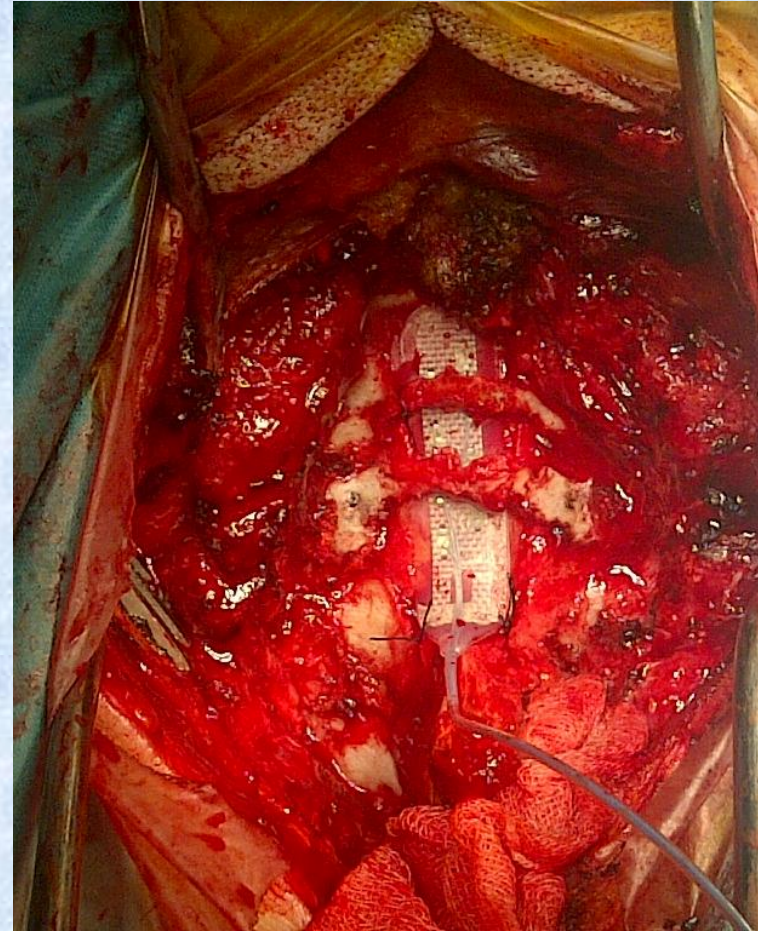
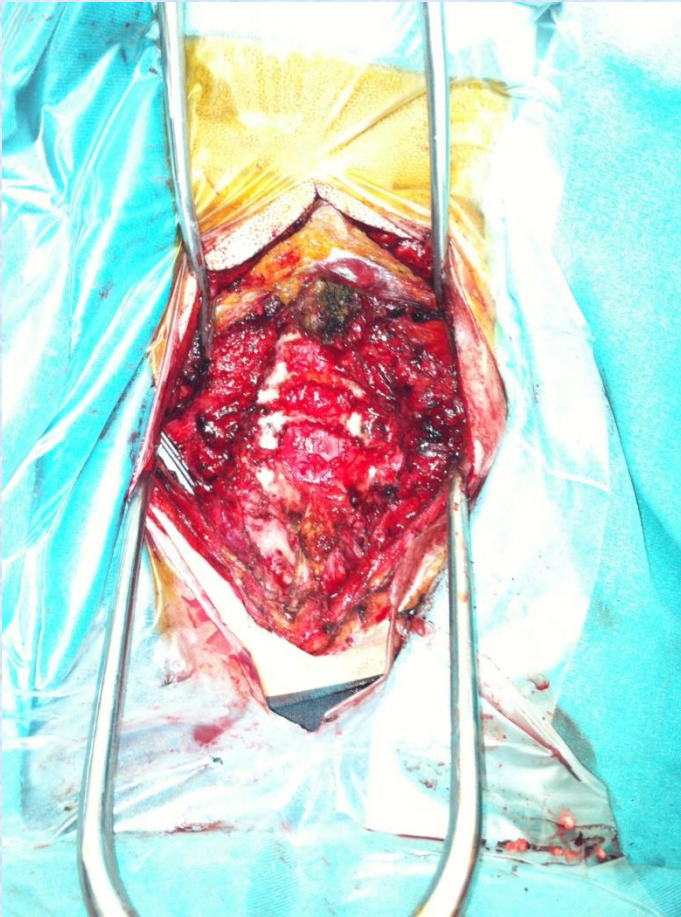
**Brakial pleksus kesisi-  
2 kez servikal perkutan SCS girişimi**





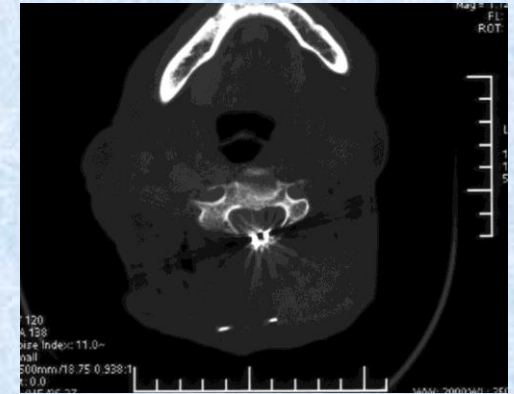
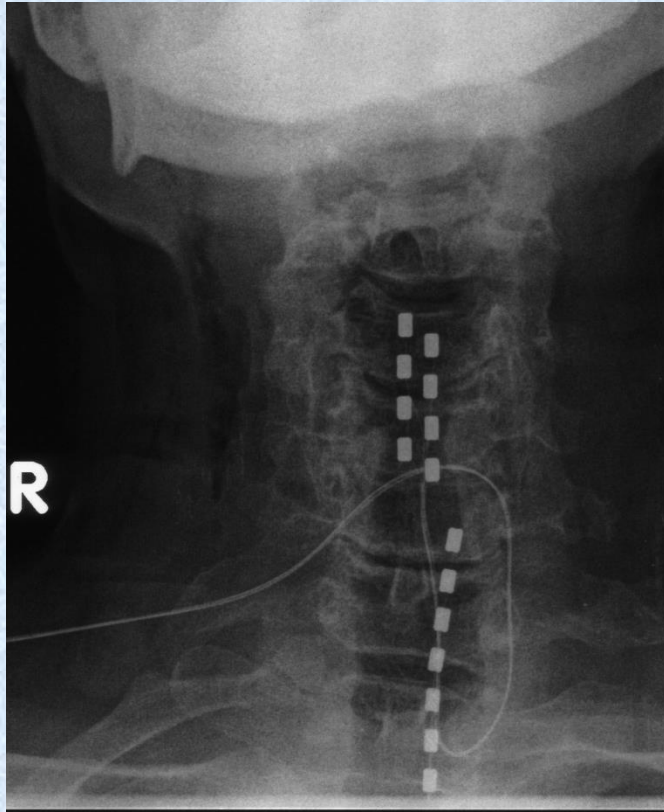
# (SERVİKAL) DORSAL COLUMN STIMULATION

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# (SERVİKAL) DORSAL COLUMN STIMULATION





# (SPİNAL) DORSAL COLUMN STIMULATION

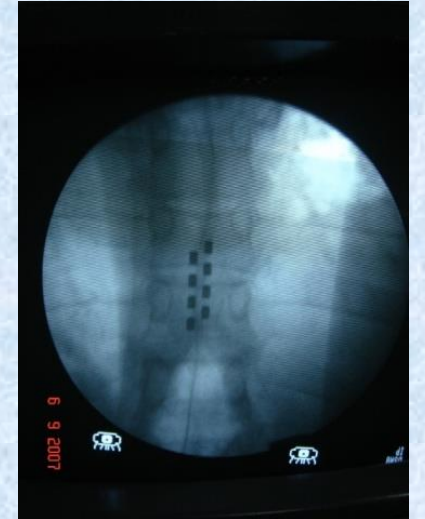
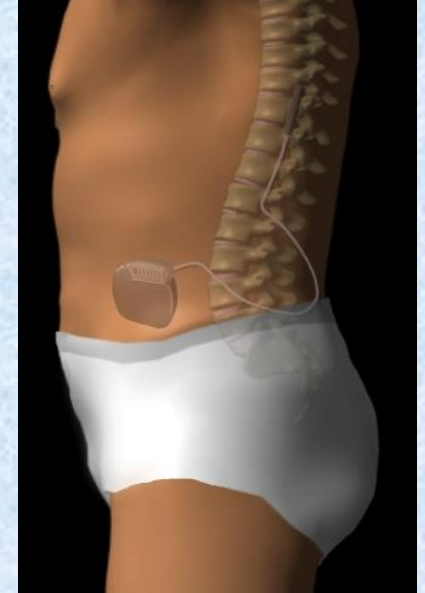
- **45 hasta**  
**40 failed back**  
**5 yıl- Etkinlik % 71**  
*(Literatür: ~ % 50)*

**2 Spinal kurşunlanma- En iyi sonuç**

**Komplikasyon: (-)**

**1 ilaç bağımlılığı-  
Stimülatör çıkartılması**

**3 Tedavi tümüyle etkisiz**





✦ Ağrı'nın cerrahi tedavisinde birçok etkin yöntem bulunmaktadır

✦ Konservatif tedavi yöntemleri yetersizse önerilmelidir

✦ Her hasta özel olarak değerlendirilip Seçilmelidir



**Wolf's Headache, 1972 –**

*“But the physician should not be surprised if the patient does not respond to this or other forms of therapy”*