

EANS COURSE
ANTALYA, Feb 2007

TRIGEMINAL NEURALGIA



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TRIGEMINAL NEURALGIA



HISTORY

- ✓ Jurjani (11th century)
- ✓ John Locke (17th century)
- ✓ Charles Bell (1829)
- ✓ Armand Trosseau (1853)
- ✓ Dandy (1932)
- ✓ Bergouingnan (1942)

TRIGEMINAL NEURALGIA



CLINICAL PRESENTATION

- ✓ brief, intense paroxysms confined to one or more divisions of the trigeminal nerve
- ✓ electric shock/stabbing
- ✓ trigger-zone

TRIGEMINAL NEURALGIA

CLINICAL PRESENTATION

- ✓ day/night
- ✓ V2, V3, V1
- ✓ increase number
- ✓ sensory disturbances

TRIGEMINAL NEURALGIA



DIFFERENTIAL DIAGNOSIS

- ✓ MS
- ✓ atypical facial pain syndromes
- ✓ cluster headache
- ✓ postherpetic neuralgia
- ✓ geniculate neuralgia (Ramsay Hunt)
- ✓ sphenopalatine ganglion neuralgia
- ✓ glossopharyngeal neuralgia
- ✓ dental disease, orbital disease
- ✓ temporomandibular dysfunction
- ✓ temporal arteritis

TRIGEMINAL NEURALGIA

IMAGING

✓ MRI

- rule out pathologies
- show vascular contact (?)
- 3D fusion MRI
- MRI virtual endoscopy

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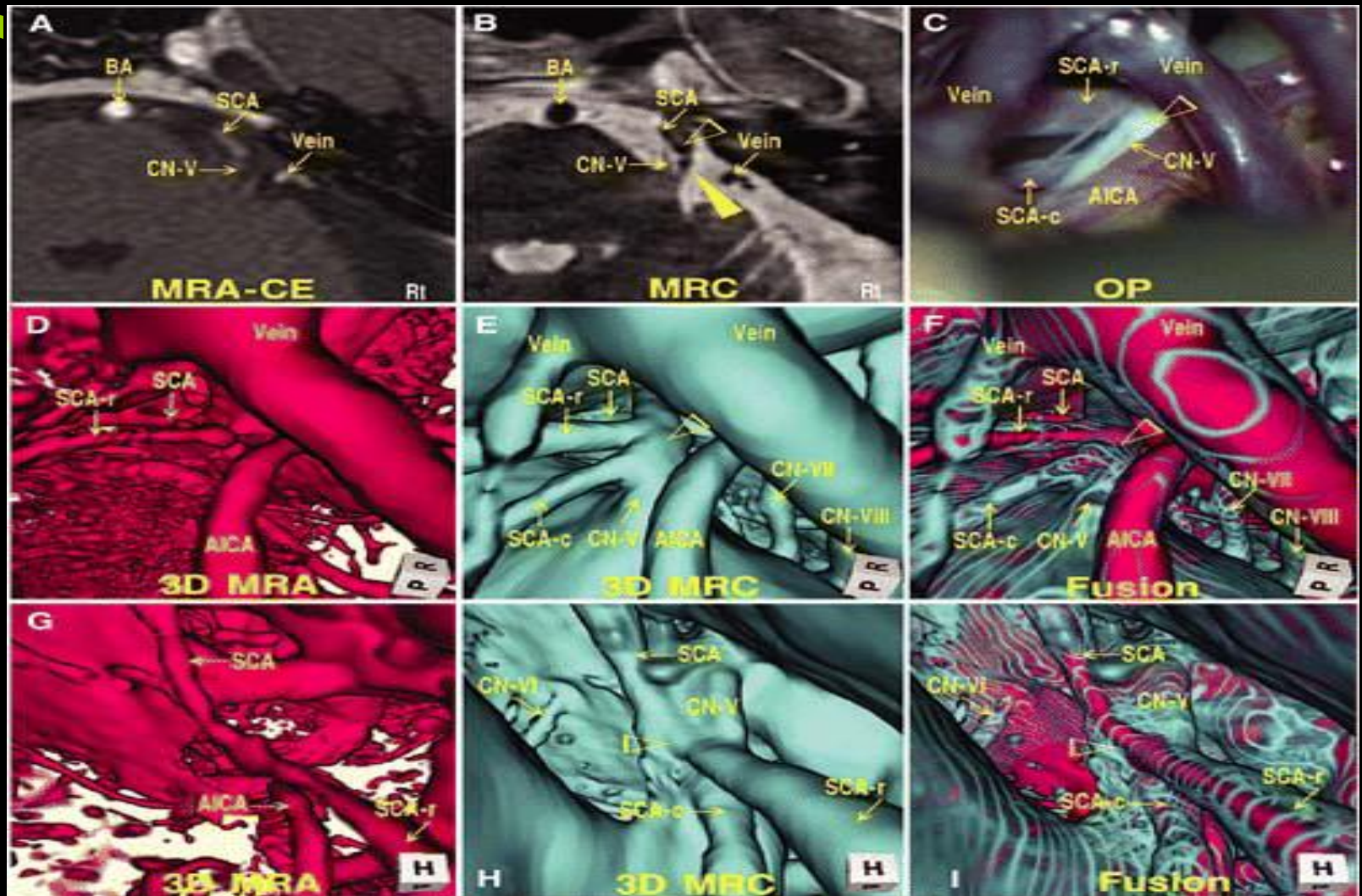


- ✓ **PREOPERATIVE SIMULATION FOR MICROVASCULAR DECOMPRESSION IN PATIENTS WITH IDIOPATHIC TRIGEMINAL NEURALGIA: VISUALIZATION WITH THREE-DIMENSIONAL MAGNETIC RESONANCE CISTERNOGRAM AND ANGIOGRAM FUSION IMAGING.**

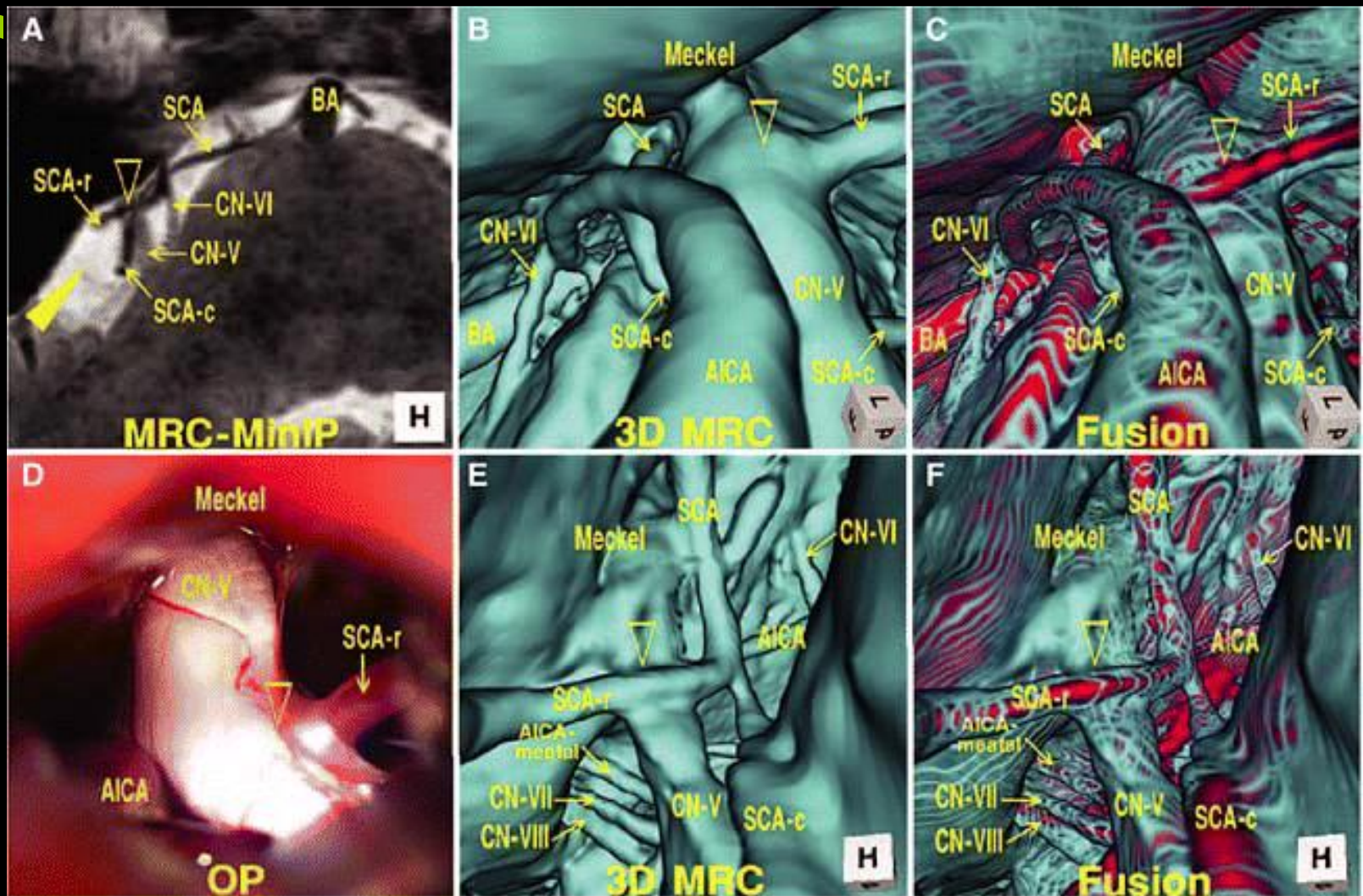
Satoh, Toru M.D.; Onoda, Keisuke M.D.; Date, Isao M.D.

- ✓ Neurosurgery. 60(1):104-114, January 2007

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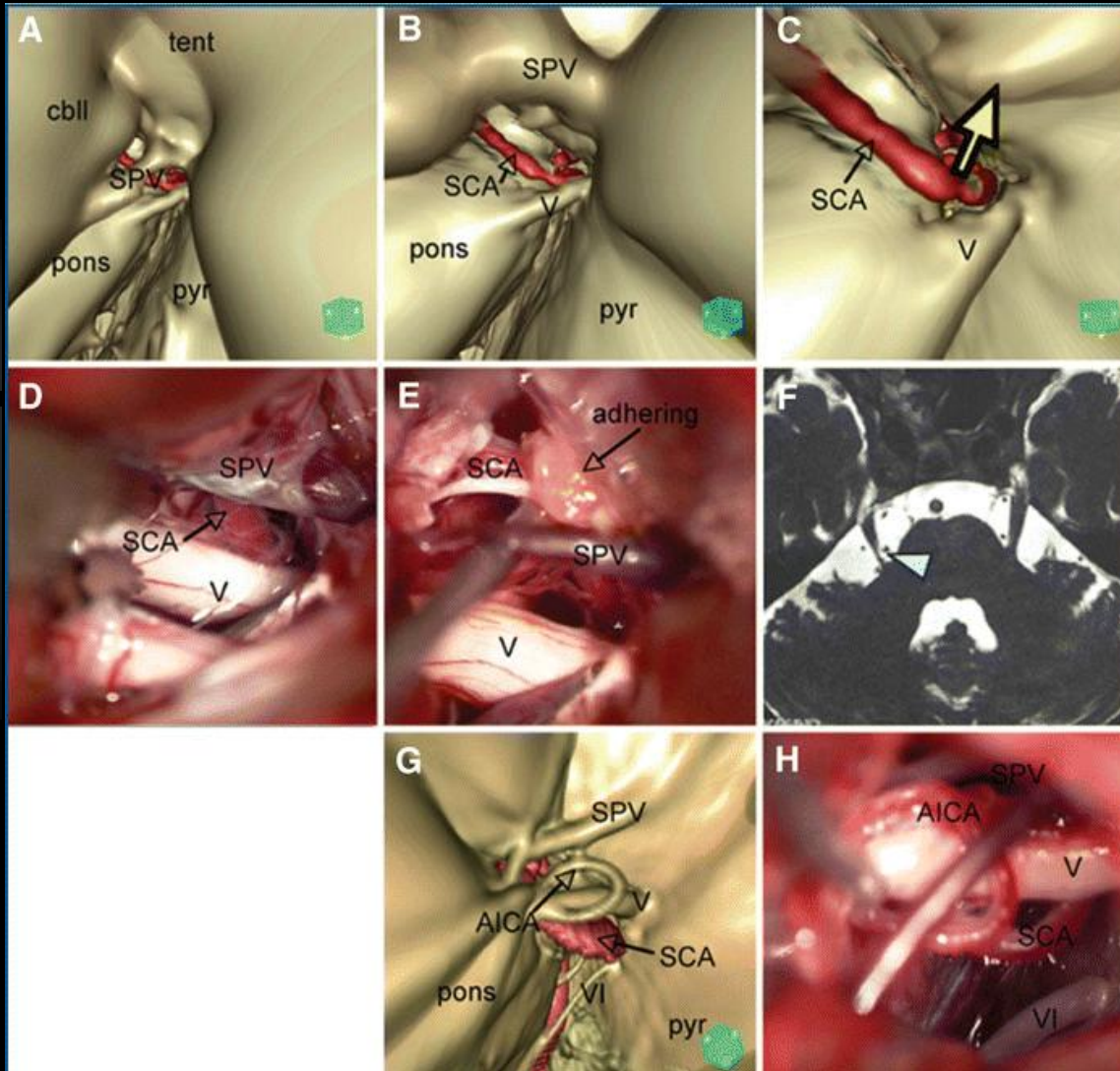


TRIGEMINAL NEURALGIA



- ✓ **THREE-DIMENSIONAL VISUALIZATION OF NEUROVASCULAR COMPRESSION: PRESURGICAL USE OF VIRTUAL ENDOSCOPY CREATED FROM MAGNETIC RESONANCE IMAGING**
- ✓ **[FUNCTIONAL AND STEREOTACTIC: Technique and Application]**
- ✓ Takao, Tetsuro M.D.; Oishi, Makoto M.D.; Fukuda, Masafumi M.D.; Fujii, Yukihiro M.D.; Ishida, Go; Sato, Mitsuya M.D.
- ✓ Neurosurgery: Volume 63(1) Operative Neurosurgery Supplement 1 July 2008p ONS139-ONS146

TRIGEMINAL NEURALGIA



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MEDICAL THERAPY

- ✓ carbamazepine
- ✓ phenytoin
- ✓ oxcarbazepine
- ✓ gabapentin
- ✓ lamotrigine
- ✓ clonazepam
- ✓ baclofen

TRIGEMINAL NEURALGIA



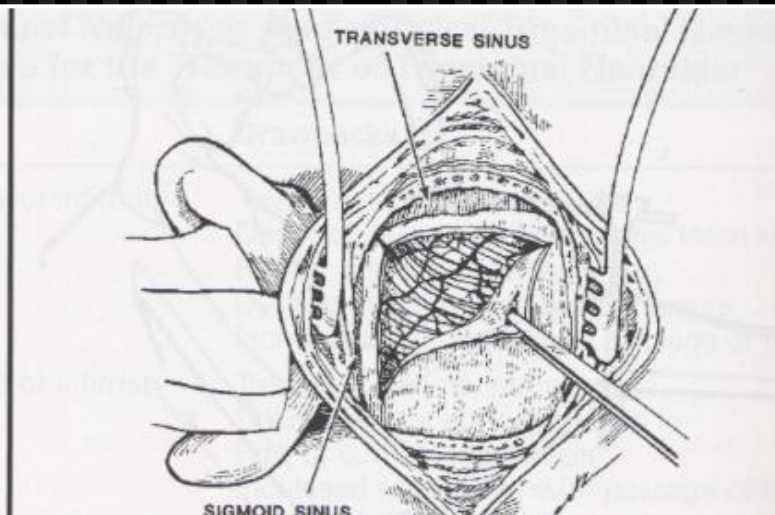
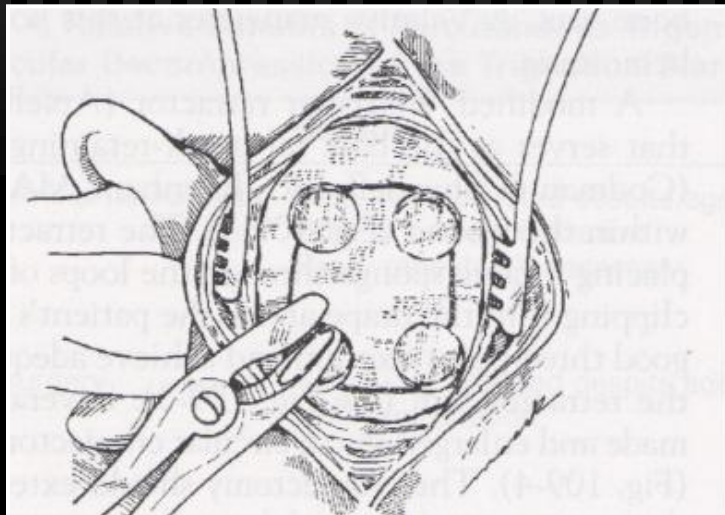
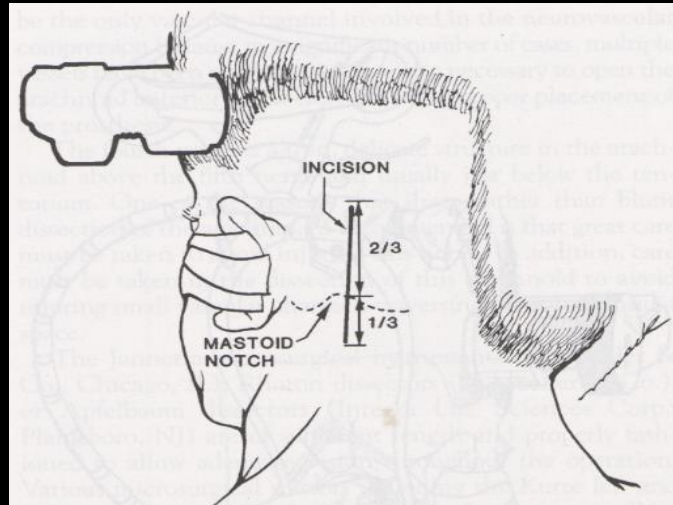
SURGICAL TREATMENT

- ✓ mvd
- ✓ selective percutaneous lesion
(RF, balloon, glycerol)
- ✓ radiosurgery

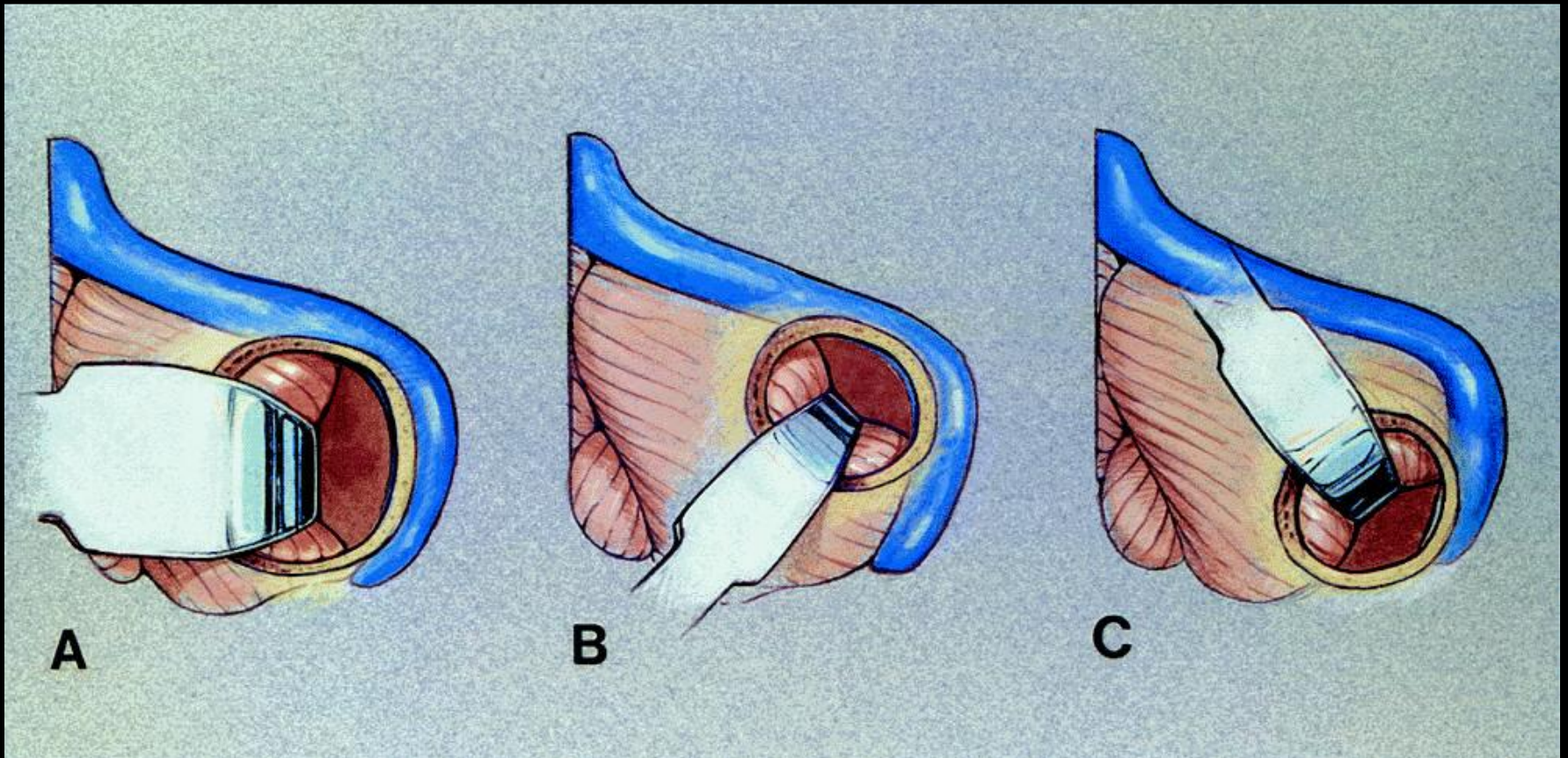
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Procedure	Benefits	Drawbacks
Percutaneous trigeminal neurolysis	Safe, well tolerated despite age or infirmity Brief or no hospitalization Easily repeated if necessary	Treats symptoms, not cause Destructive, permanently alters facial sensation Risk of corneal anesthesia Dyesthetic sequelae can be severe Increased recurrence with passage of time
Stereotactic radiosurgery	Safe, well tolerated despite age or infirmity No hospitalization	Treats symptoms, not cause Delayed therapeutic response Risk of corneal anesthesia Increased recurrence with passage of time Limited therapeutic data
Microvascular decompression	Sparses nerve, nondestructive No numbness No dyesthesia No corneal anesthesia Treats apparent cause, may be curative	General anesthesia required Craniectomy required Increased risk of serious and lethal complications Should be limited to healthy, relatively young (<65–70 yr) patients

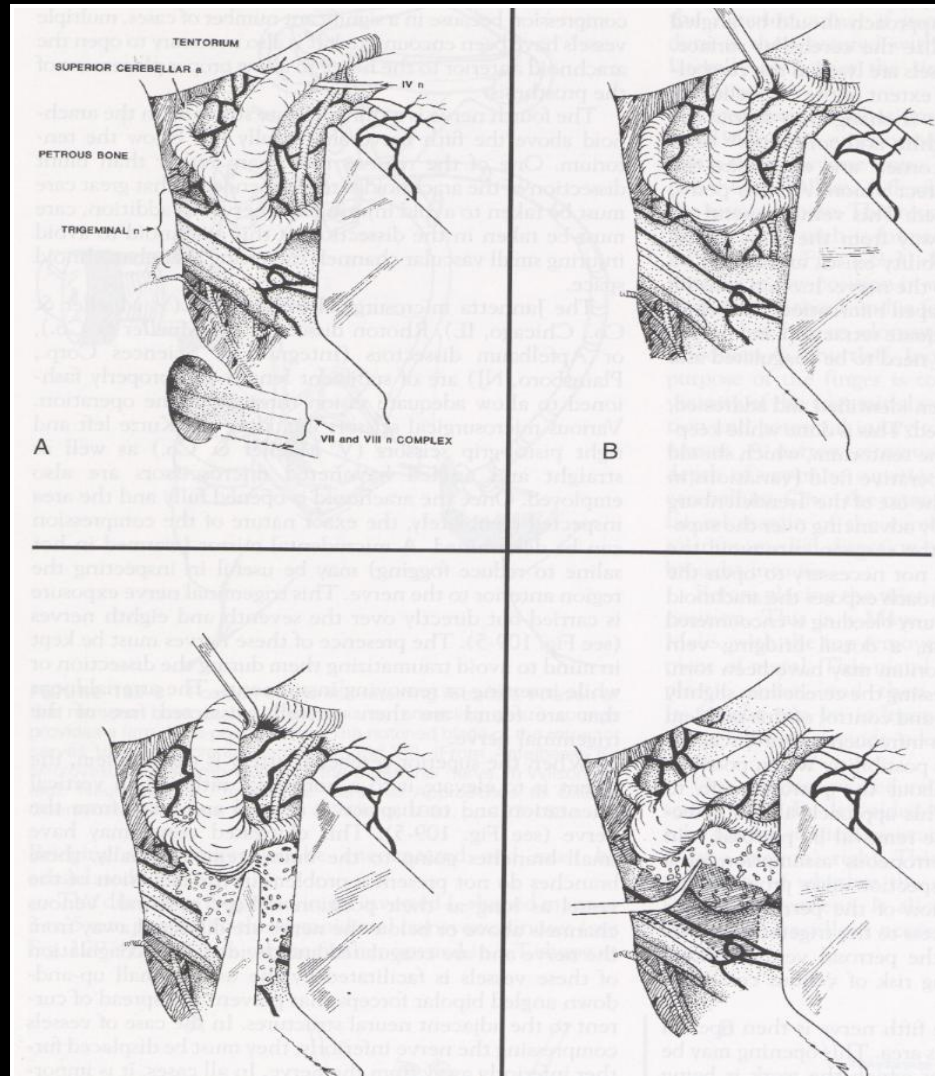
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OPERATIVE FINDINGS (97%)

✓ arterial channels	374 (80,3%)
✓ venous channels	65 (13,9%)
✓ tumor	12 (2,6%)
✓ negative	15 (3,2%)
✓ total	466

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COMPRESSIVE ARTERY

- ✓ SCA – 80%
- ✓ SCA+AICA – 9%
- ✓ AICA – 8%
- ✓ Basilar – 2%
- ✓ Others – 1%

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INITIAL RESULTS

- ✓ complete relief – 91%
- ✓ pain reduced – 6%
- ✓ pain not relieved – 2%
- ✓ death – 1%

Russel R. Lonser and Ronald I. Apfelbaum
“Operative Neurosurgical Techniques”
Vol 2, pp 1531-1538 (2006)

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COMPLICATIONS

- ✓ cranial nerve dysfunction – 12,6%
- ✓ dizziness, ataxia – 3%
- ✓ infarction – 1,8%
- ✓ seizures – 1%
- ✓ death – 1%

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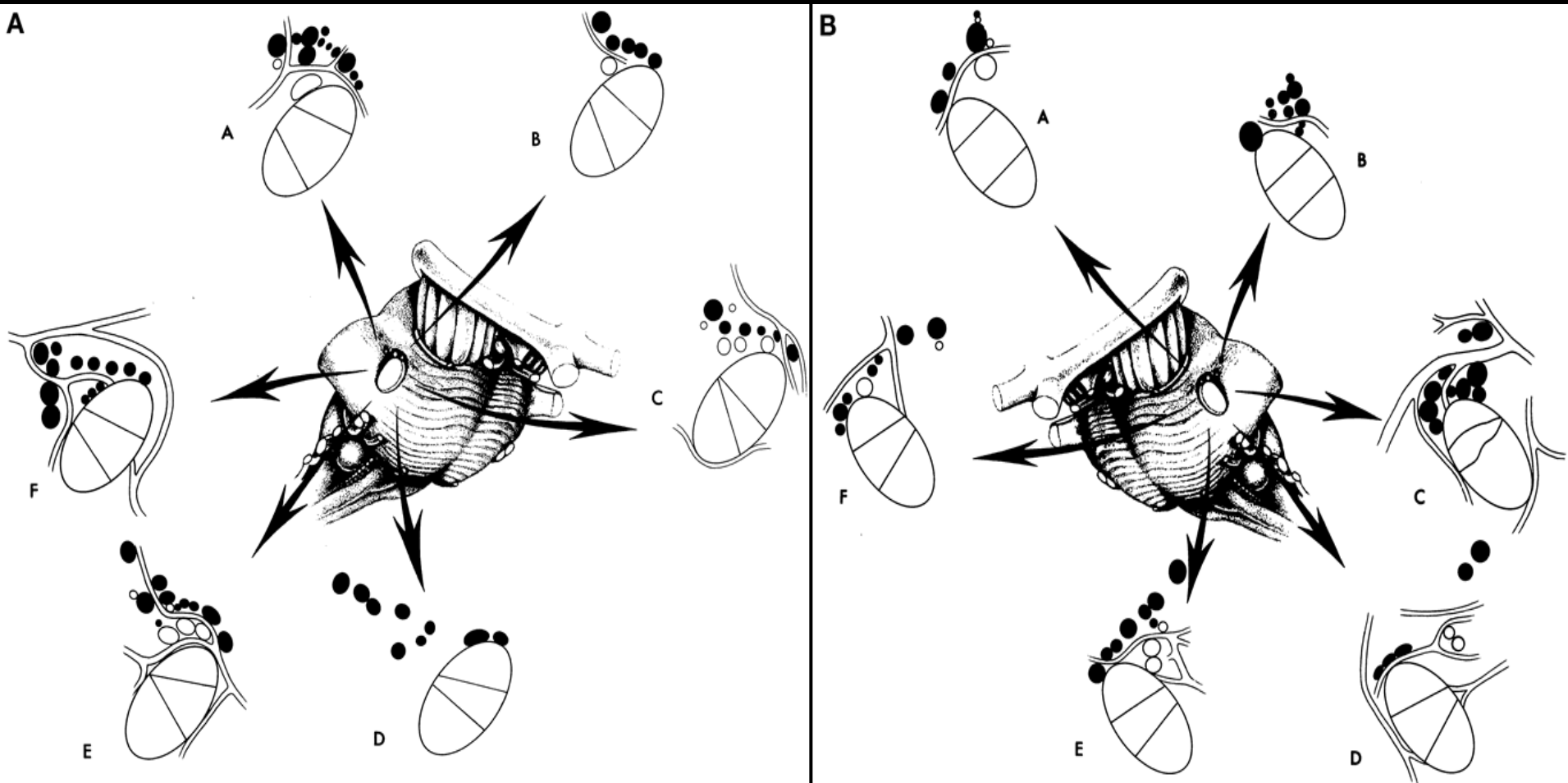
LONG-TERM RESULTS

- ✓ no recurrence - 62%
- ✓ mild pain (no medication) - 5%
- ✓ pain controlled with medication - 14%
- ✓ severe pain not controlled “ - 18%
- ✓ died - 1%

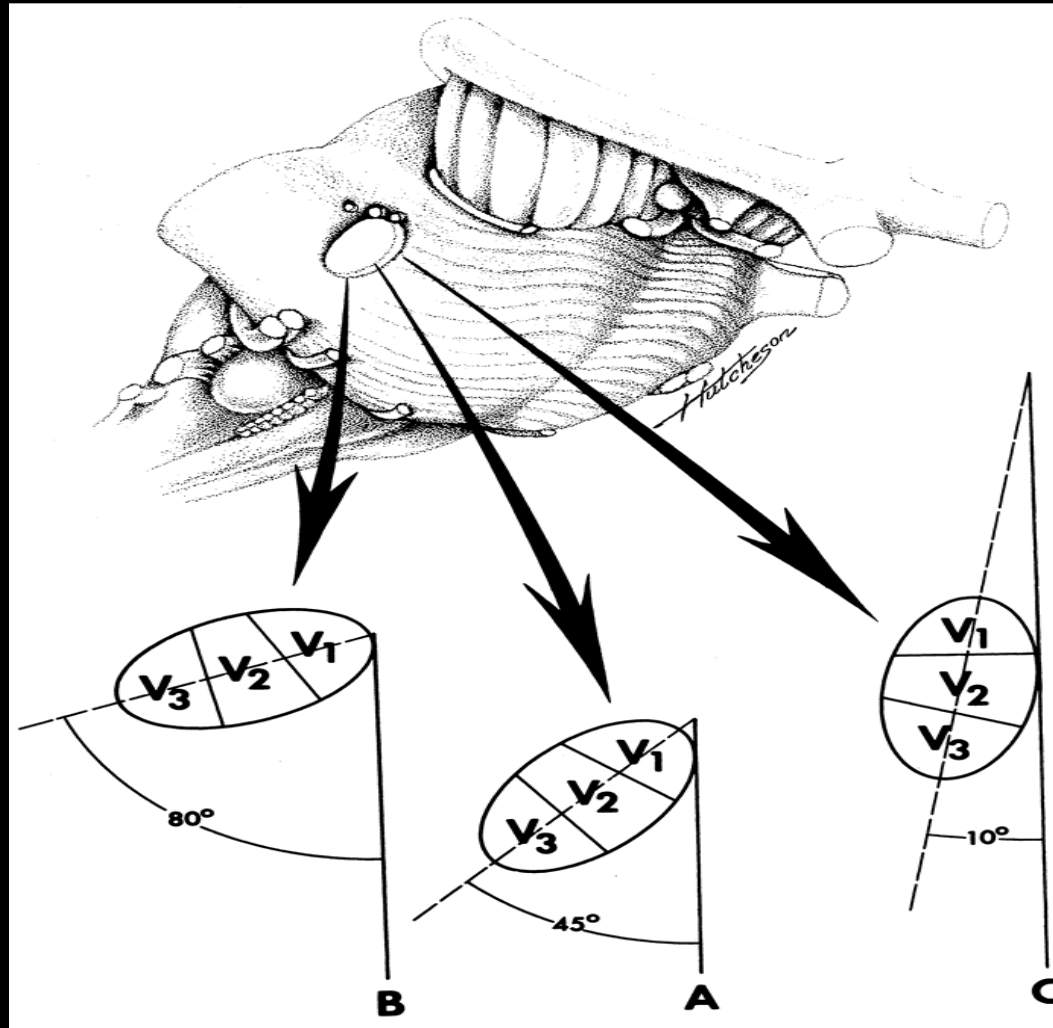
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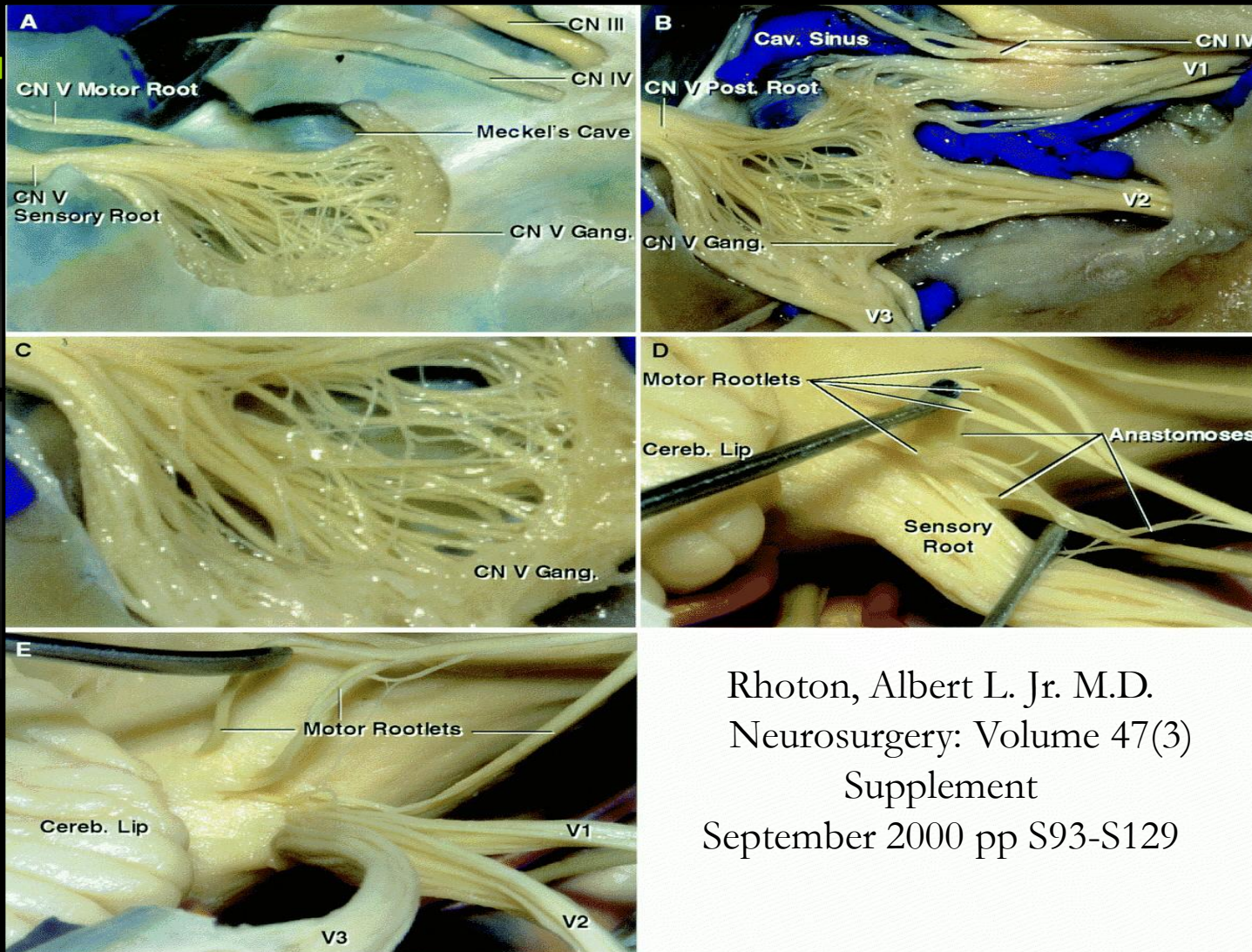
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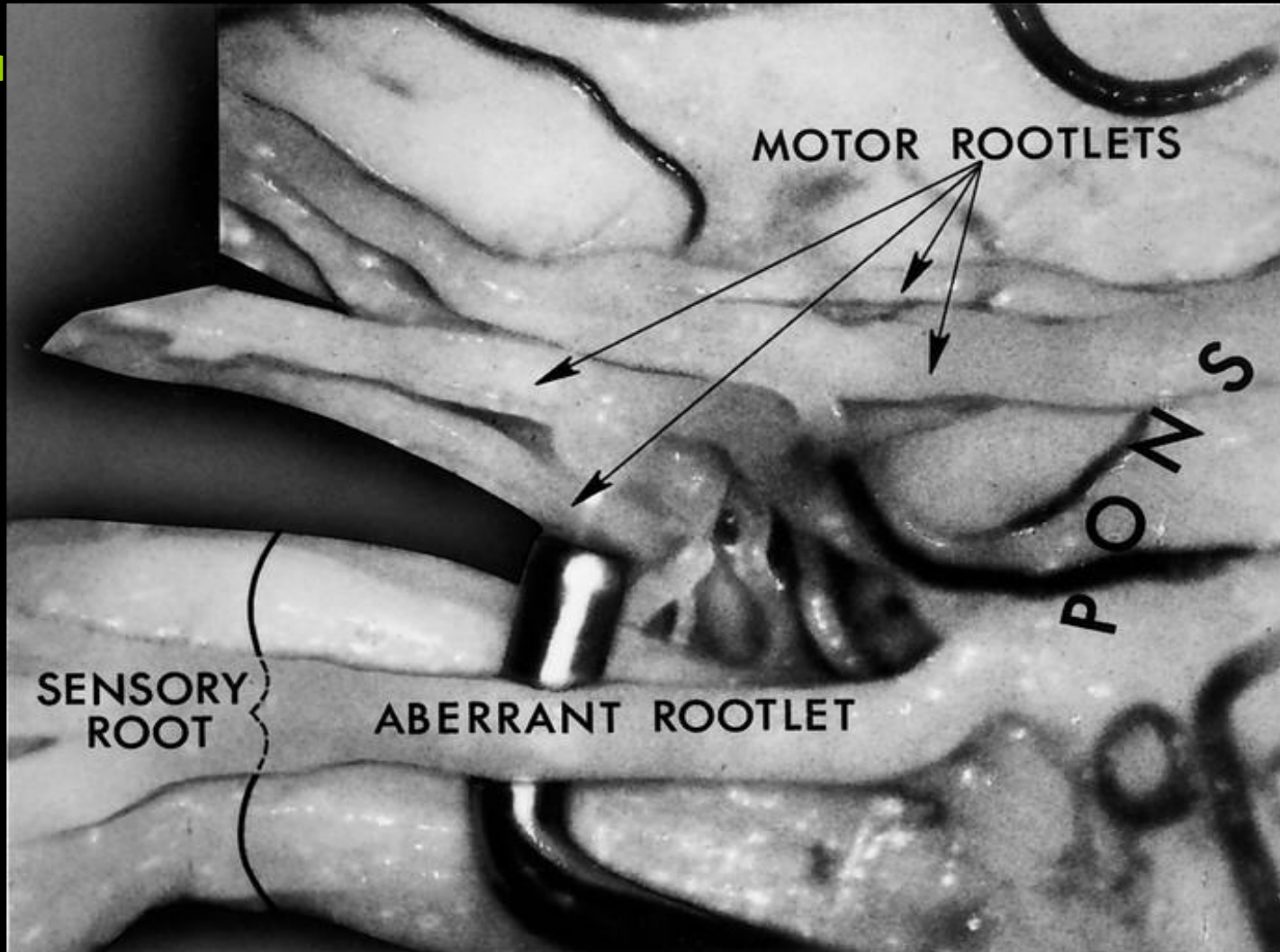


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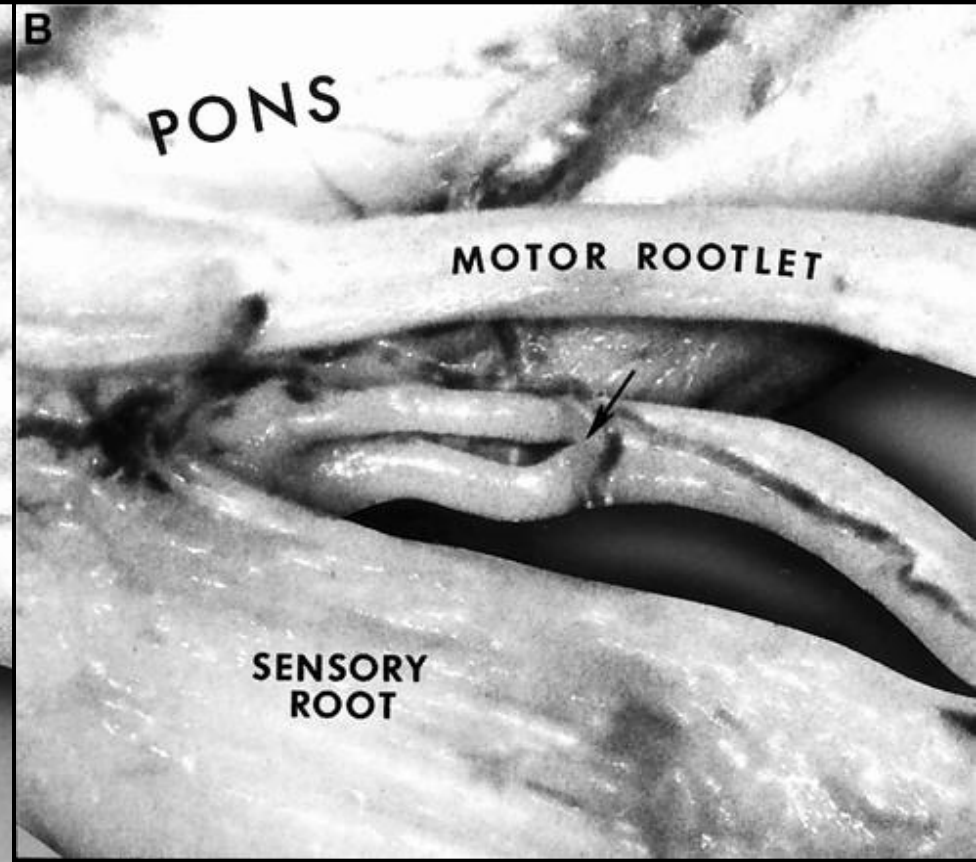
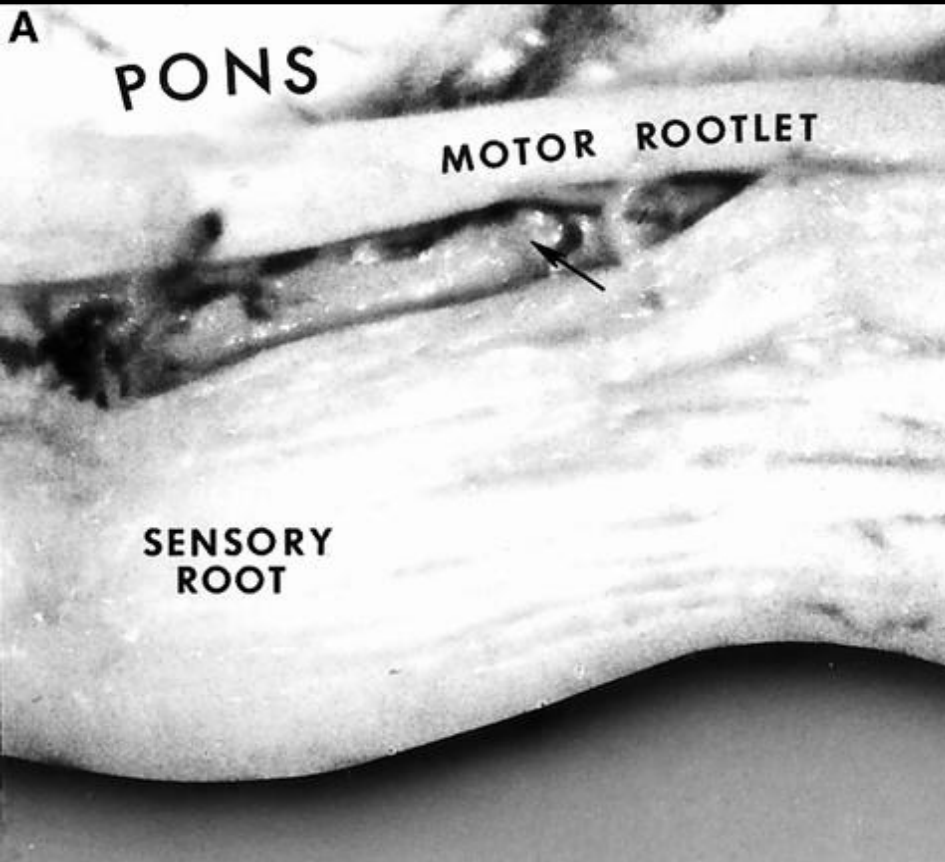


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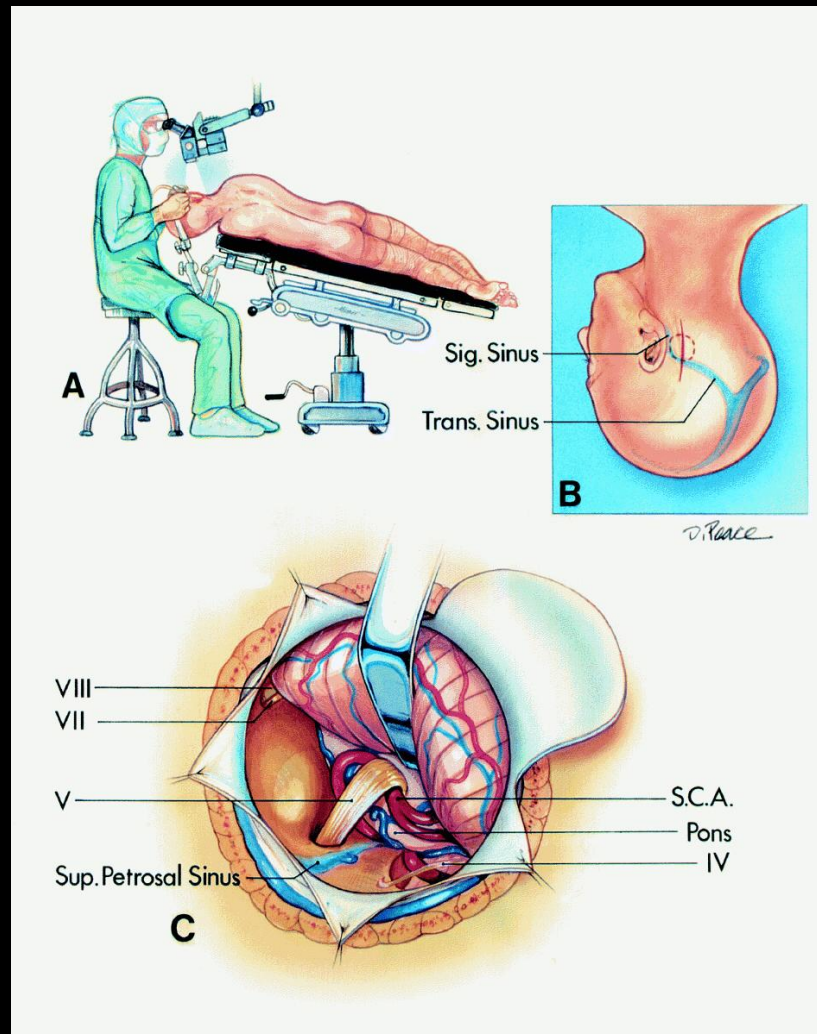
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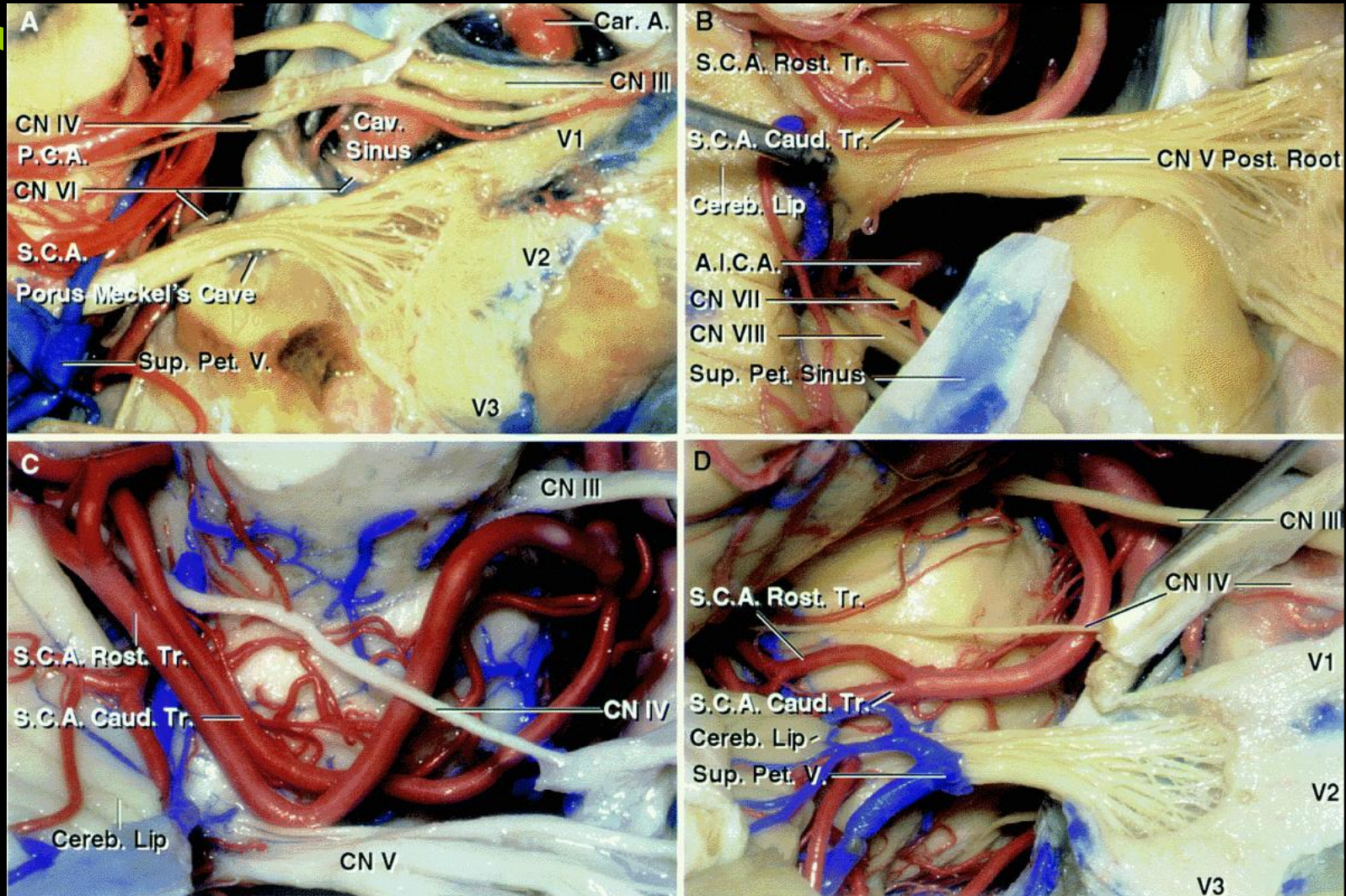
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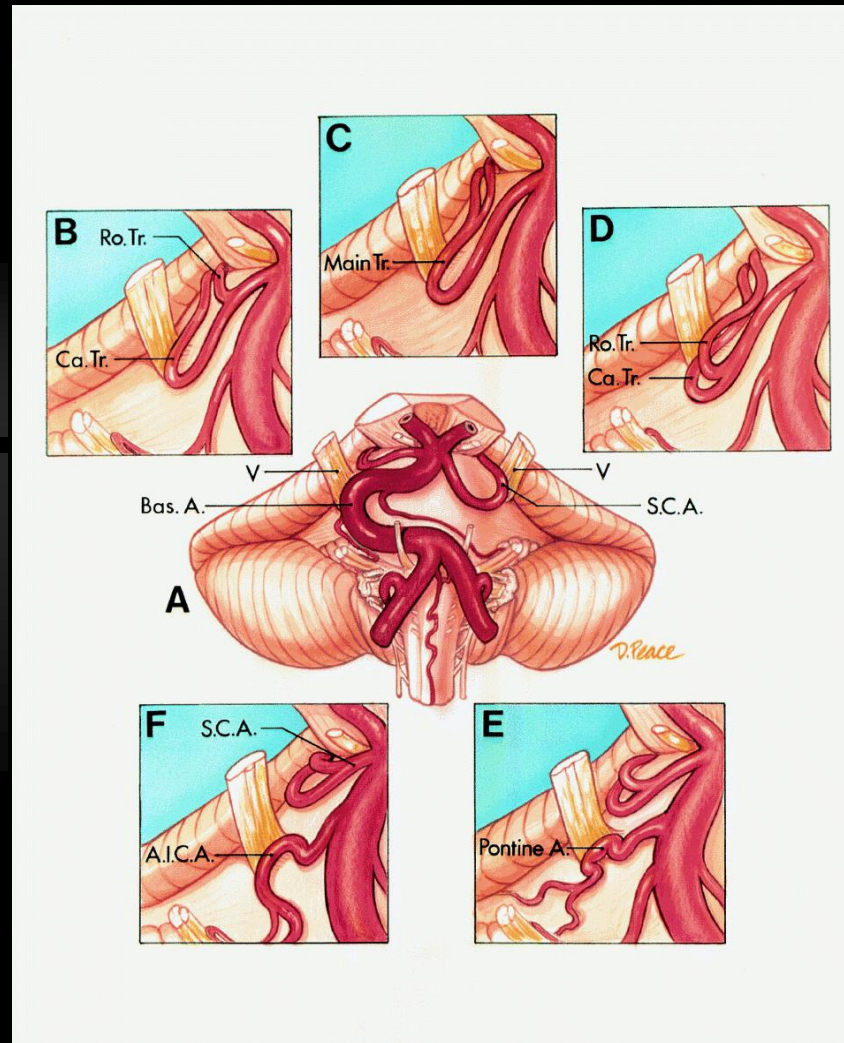
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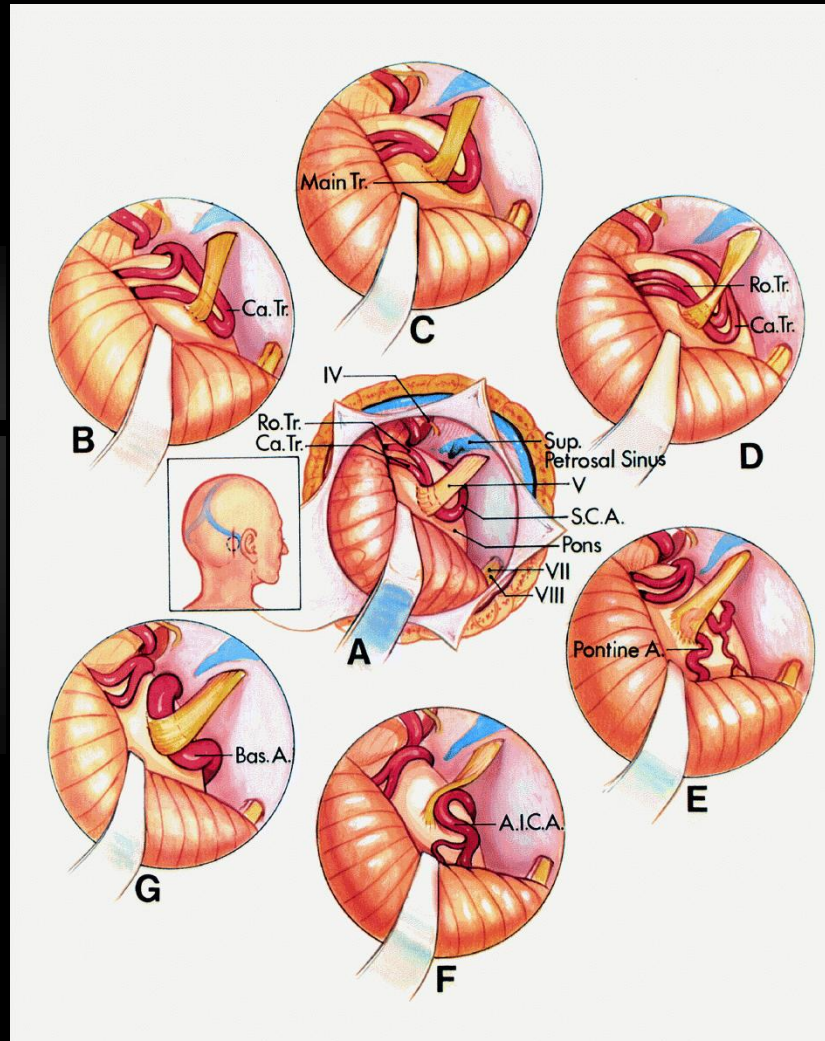
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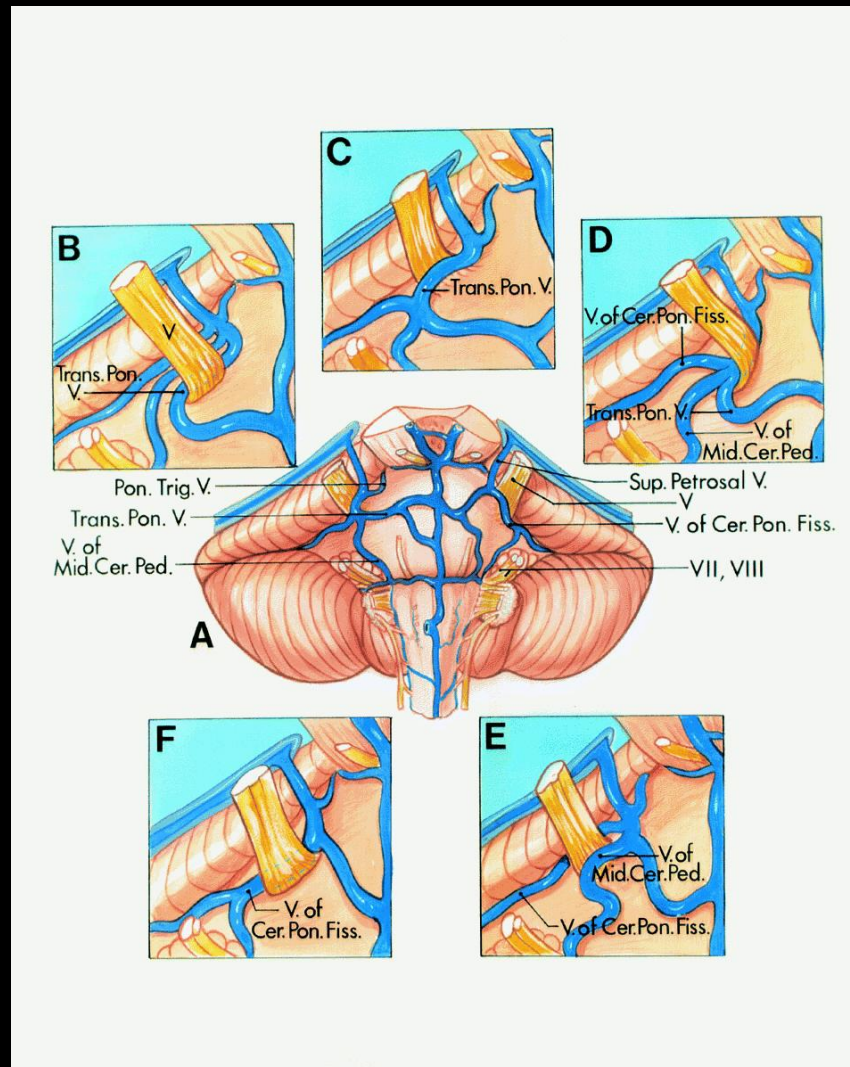
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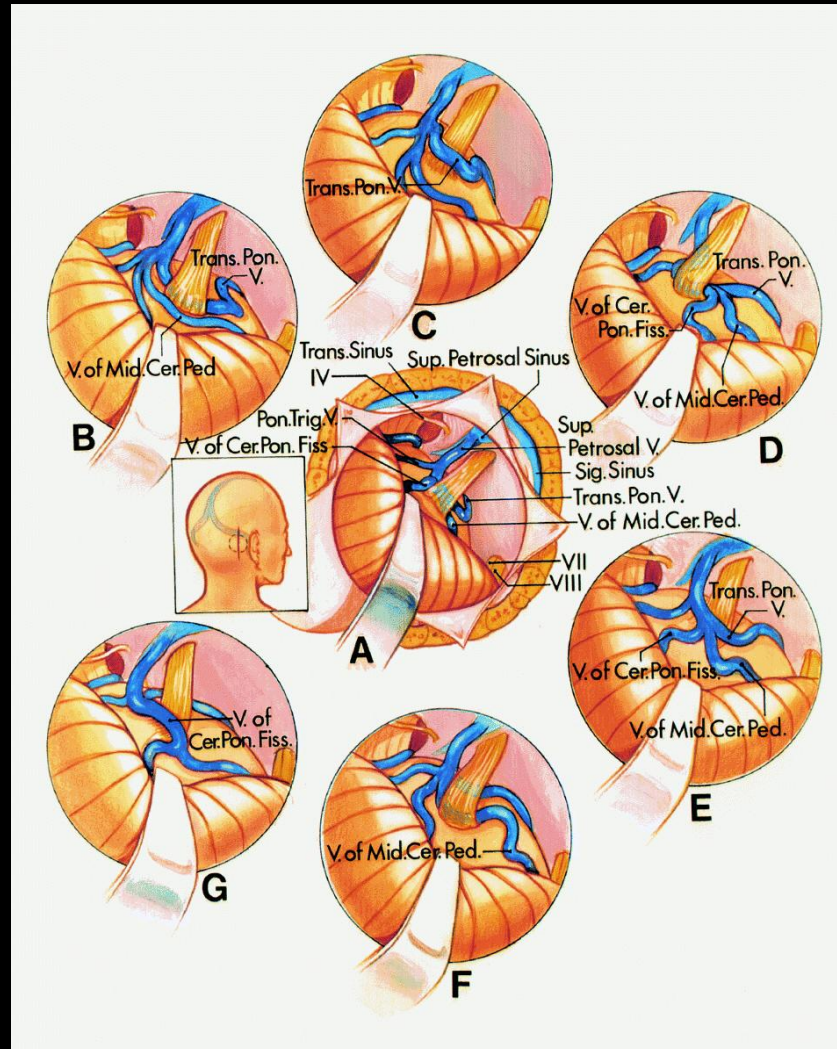
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- ✓ RETROGASSERIAN GLYCEROL RHIZOLYSIS
- ✓ PERCUTANEOUS RADIOFREQUENCY RHIZOTOMY
- ✓ BALLOON COMPRESSION
- ✓ STEREOTACTIC RADIOSURGERY

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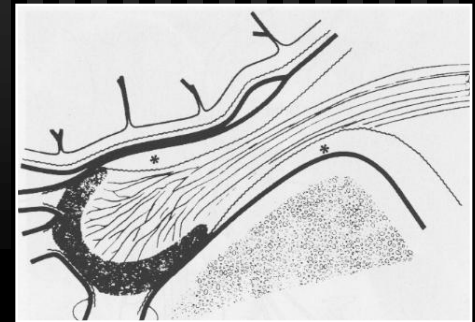
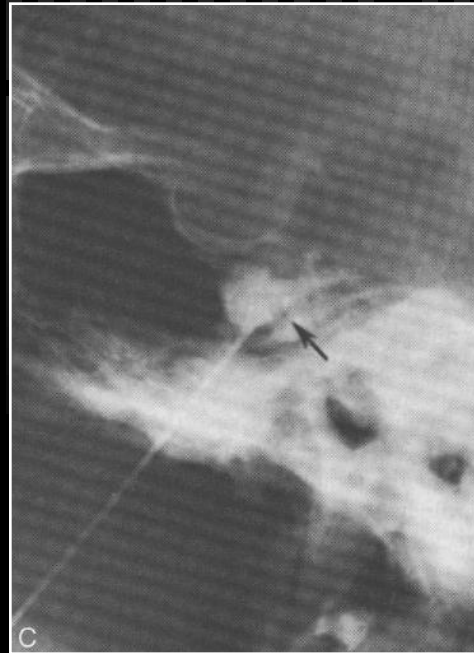
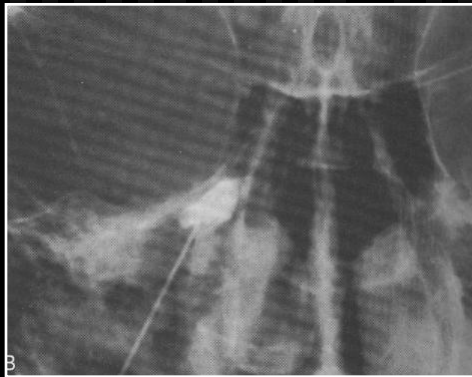
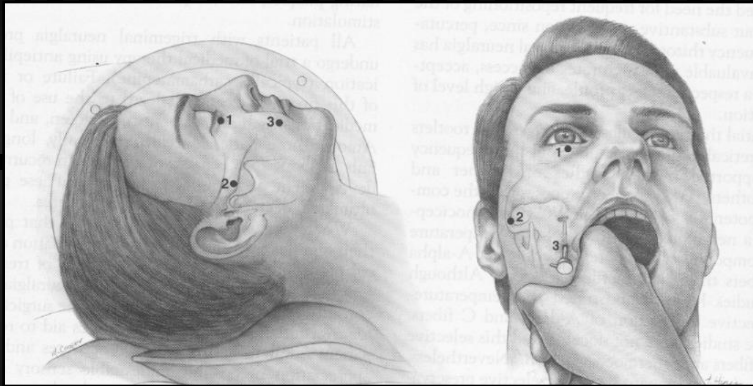


GLYCEROL RHIZOLYSIS

- ✓ classic ITN in elderly, infirm patients
- ✓ MS
- ✓ recurrence after MVD

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GLYCEROL RHIZOLYSIS



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GLYCEROL RHIZOLYSIS

TABLE 106-1 ■ Results of Glycerol Rhizolysis*

Authors	No. of Patients	With Cisternography (%)	Pain Free after First Injection (%)	Total Pain Free at Follow-up (%)
Håkanson ⁴⁹ (1983)	100	100	>96 [†]	>75
Lunsford ⁴⁸ (1985)	62	100	>74 [†]	>66
Murias ⁵ (1986)	100	50	>95 [†]	>95
Neck et al ⁶³ (1986)	58	31	>67 [†]	>72
Dieckmann et al ⁷ (1987)	252	100	>91 [†]	>85
Saini ⁵¹ (1987)	550	0	>76 [†]	>17
Purchiel ³⁹ (1988)	46	100	>80 [†]	>53
Young ⁸ (1988)	162	Some	>90 [†]	>78
Valtz et al ⁷⁴ (1989)	200	100	>73 [†]	>74
Ujimaki et al ¹² (1990)	122	100	>80 [†]	>26
North et al ⁵⁰ (1990)	85	0	>90 [†]	>50
Schia et al ⁵⁴ (1990)	112	100	>92 [†]	>71
Teiger ⁵² (1991)	122	100	>84 [†]	>59
Lettebø et al ⁵⁵ (1993)	60	100	>93 [†]	>50
Bergenheim and Hariz ⁵⁶ (1995)	99	100	>97 [†]	>76
Cho and Lunsford ⁴² (1997)	523	100	>90 [†]	>55
Lomstedt and Bergenheim ⁵⁸ (2002)	139	100	>95 [†]	50
Lebles et al ⁵⁷ (2003)	30	100	‡	66

Outcomes of 18 major studies. Number of patients, use of cisternography for ascertaining intracisternal injection, percentage of patients with intracanalicular relief after first injection, and percentage of patients pain free (including reinjections) at follow-up are given.

[†]Most failures previously treated by destructive method; otherwise 96%.

[‡]Not reported.

TRIGEMINAL NEURALGIA

GLYCEROL RHIZOLYSIS

TABLE 106-2 ■ Pain Recurrence after Glycerol Rhizolysis*

Authors	No. of Patients	Early Recurrence (<2 yr, %)	Late Recurrence (>2 yr, %)	Range of Follow-up
Håkanson ⁴⁹ (1983)	100	~26	-43	5-10 yr
Lunsford ⁴⁸ (1985)	62	~21	~†	3-28 mo
Arias ⁵ (1986)	100	~2	~10†	2-3 yr
Beck et al ⁶³ (1986)	58	~11	~†	2-40 mo
Dieckmann et al ⁷ (1987)	252	~11	~37†	2-5 yr
Saini ⁵¹ (1987)	550	~41	~92†	1-6 yr
Burchiel ³⁹ (1988)	46	~47	~75†	3-44 mo
Young ⁸ (1988)	162	~11	~34†	6-67 mo
Waltz et al ⁷⁴ (1989)	200	~23	~25†	25-64 mo
Fujimaki et al ¹² (1990)	122	~45	~72†	38-54 mo
North et al ⁵⁰ (1990)	85	~40	~55†	6-54 mo
Ischia et al ⁵⁴ (1990)	112	~20	~26†	1-5 yr
Steiger ⁵² (1991)	122	~30	~41†	1-96 mo
Slettebø et al ⁵⁵ (1993)	60	~27	~55†	4.5-9 yr
Bergenheim and Hariz ⁵⁶ (1995)	99	~33 (1 yr)	~†	12 mo
Jho and Lunsford ⁴² (1997)	523	~13	~†	11 yr
Blomstedt and Bergenheim ⁵⁸ (2002)	139	~35	~45	Up to 11 yr
Febles et al ⁵⁷ (2003)	30	†	33	Median 33.5 mo

*Percentage of patients in each series with early recurrence (within 2 years) after treatment and late (cumulative) recurrence (after 2 years). Follow-up range is also indicated.

†Not reported.

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GLYCEROL RHIZOLYSIS

TABLE 106-3 ■ Sensory Complications after Glycerol Rhizolysis*

Authors	No. of Patients	Volume of Glycerol (mL)	Slight Hypesthesia (%)	Severe Hypesthesia (%)	Dysesthesia (%)
Håkanson ⁴⁹ (1983)	100	0.2–0.3	60	0	0
Lunsford ⁴⁸ (1985)	62	0.15–0.25 [†]	21 [†]	0	3 [‡]
Arias ⁵ (1986)	100	0.1–0.4	13	0	0
Beck et al ⁶³ (1986)	58	0.2–0.4	17	2	0
Dieckmann et al ⁷ (1987)	252	0.15–0.4	20	1	2
Saini ⁵¹ (1987)	550	0.2–0.3	**	5 [§]	11
Burchiel ³⁹ (1988)	46	0.15–?	72	7	13
Young ⁸ (1988)	162	0.15–0.55	72	12	3
Waltz et al ⁷⁴ (1989)	200	0.2–0.6	37	7	2
Fujimaki et al ¹² (1990)	122	0.3–0.5	63	29	26
North et al ⁵⁰ (1990)	85	0.3–0.4	4	2 [¶]	4 [¶]
Ischia et al ⁵⁴ (1990)	112	0.4–0.5	32	0	3
Steiger ⁵² (1991)	122	0.2–0.35 [†]	53 [†]	**	13
Slettebø et al ⁵⁵ (1993)	60	0.15–0.70	35 [§]	3 [§]	13
Bergenheim and Hariz ⁵⁶ (1995)	99	0.20–0.35	42	6	5
Jho and Lunsford ⁴² (1997)	523	0.20–0.50	32	6 [†]	2
Blomstedt and Bergenheim ⁵⁸ (2002)	139	0.13–0.35	47.3	45.5	22.7
Febles et al ⁵⁷ (2003)	30	**	53	13	**

*Percentage of different types of sensory disturbance in each series. Range of glycerol volumes used is also indicated. In several series, it cannot readily be judged in sensory disturbances recorded after glycerol treatment were already present before the procedure. Furthermore, other destructive procedures may have been subsequently used without specific notice.

[†]Many with previous or additional destructive procedures.

[‡]After herpes reactivation.

[§]Only cases with previous destructive procedures.

[¶]Transient.

**Not reported.

TRIGEMINAL NEURALGIA

GLYCEROL RHIZOLYSIS

TABLE 106-4 ■ Infectious Complications after Glycerol Rhizolysis*

Authors	No. of Patients	Herpes Reactivation (%)	Aseptic Meningitis (%)	Bacterial Meningitis (%)
Håkanson ⁴⁹ (1983)	100	50	0	0
Lunsford ⁴⁸ (1985)	62	13	3	0
Arias ⁵ (1986)	100	10	2	0
Beck et al ⁶³ (1986)	58	9	4	0
Dieckmann et al ⁷ (1987)	252	77	1	1
Saini ⁵¹ (1987)	550	3	†	†
Burchiel ³⁹ (1988)	46	5	2	2
Young ⁸ (1988)	162	38	0	1
Waltz et al ⁷⁴ (1989)	200	†	7	1
Fujimaki et al ¹² (1990)	122	†	†	†
North et al ⁵⁰ (1990)	85	†	†	†
Ischia et al ⁵⁴ (1990)	112	†	†	†
Steiger ⁵² (1991)	122	†	0	0
Slettebø et al ⁵⁵ (1993)	60	†	1.6	†
Bergenheim and Hariz ⁵⁶ (1995)	99	†	†	†
Jho and Lunsford ⁴² (1997)	523	37	0.6	†
Blomstedt and Bergenheim ⁵⁸ (2002)	139	3.8	1.5	1.5
Febles et al ⁵⁷ (2003)	30	†	†	†

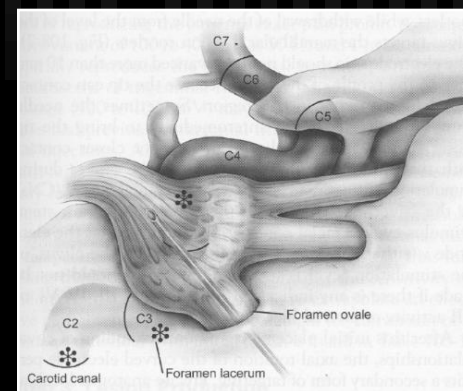
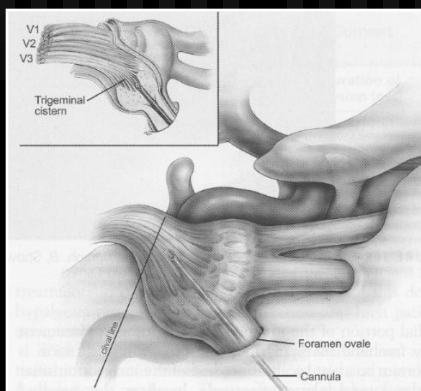
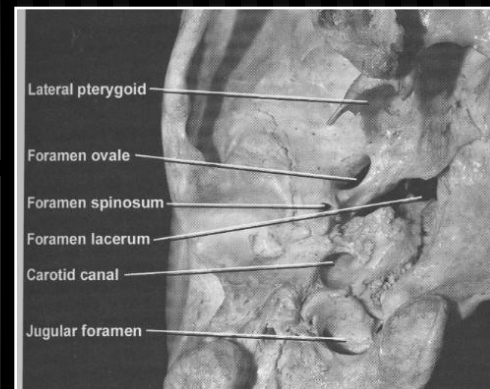
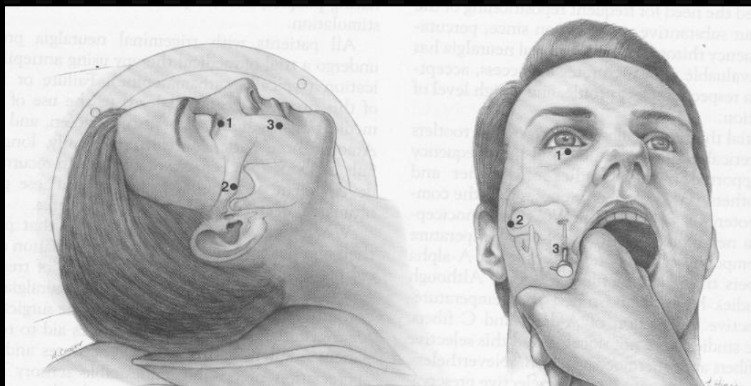
*Percentage of cases in each series with herpes simplex reactivation, aseptic meningitis, and bacterial meningitis.

†Not reported.

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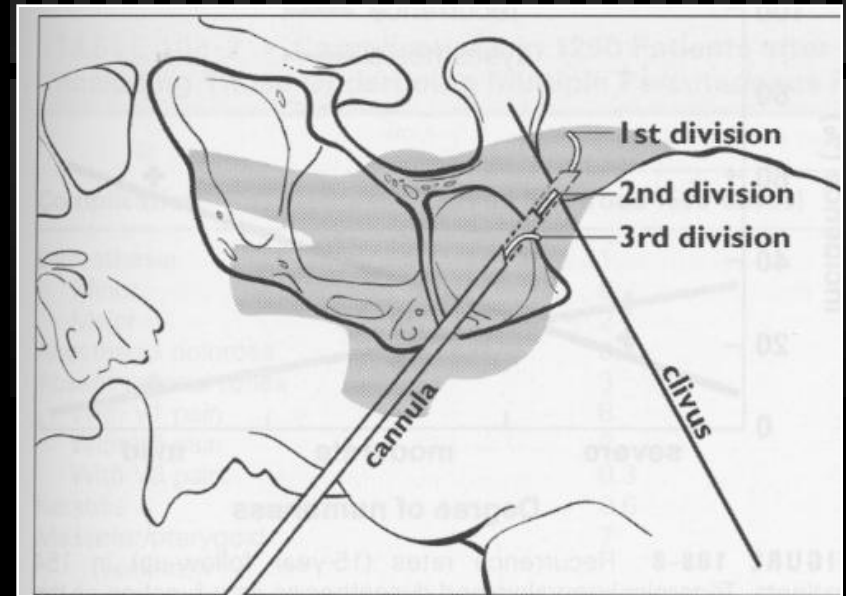
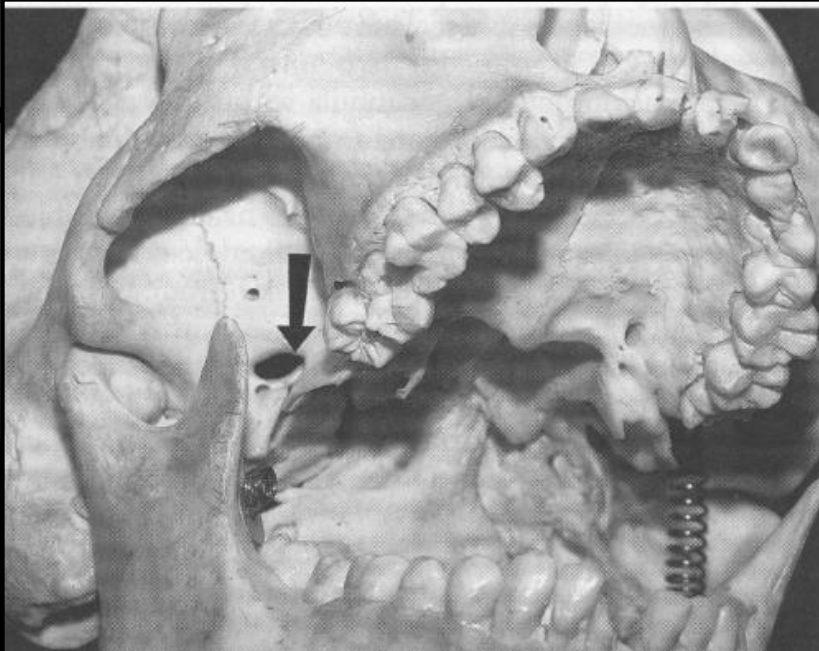
RADIOFREQUENCY



TRIGEMINAL NEURALGIA



RADIOFREQUENCY



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RADIOFREQUENCY

TABLE 108-1 ■ Proposed Paradigm to Convert a Stimulus to an Initial Lesion

Stimulation Intensity (mV)	Probe Temperature (°C)	Duration of Lesion (sec)
<0.3	60	60
0.3–0.4	65	60
0.4–0.8	70	60
0.8–1.0	75	60
>1.0	Abort and reposition electrode	

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RADIOFREQUENCY

TABLE 108-3 ■ Results of Percutaneous Stereotactic Radiofrequency Rhizotomy in Series (Since 1989) of at least 100 Patients

Series	No. of Patients (n)	Follow-up (yr)	Percentage (%)						
			Long-Term Pain Relief	Significant Dysesthesia	Corneal Analgesia	Trigeminal Motor Weakness	Cranial Nerve Palsy	PO Morbidity	Severe PO Morbidity or Mortality
Fraioli et al ¹⁶	533	6.5	89	NR	3	3	0.2	0.2	0
Frank and Fabrizi ¹⁷	700	>3	75	NR	1	8	0.1	0.1	0
Miserocchi et al ¹⁸	111	1-7	80	6.3	2	NR	0	0	0
Broggi et al ¹⁹	1000	9	78	6.5	17	10	0.5	0.5	0
Sweet ²⁰	702	5.5	63	9	9	65	0.4	0.5	0
Ischia et al ²¹	124	3.7	67	6	2	3	4	NR	NR
Nugent ²²	1070	9	73	6.5	3.5	26	0.2	0.5	0.2
Zakrzewska and Thomas ²³	265	3.8	71	8	9	NR	NR	NR	0
Tew and Taha ²⁴	1200	9	79	4	6	16	1	1.3	0
Oturai et al ²⁵	185	1-16 (avg 8)	51	4	NR	NR	NR	NR	NR
Spendel et al ²⁶	182	0.5-10	95	NR	NR	NR	NR	NR	NR
Mathews and Scrivani ²⁷	258	1-6.5 (avg 3)	74	8	2.3	28.8	0	0	0
Kanpolat et al ²⁸	1600	1-5	75	1.8	5.7	4.1	0.13	1.6	0
Tronnier et al ²⁹	316	14	25	0.9	0	NR	0.8	NR	0.8

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 avg, average; NR, not reported; PO, postoperative.

TRIGEMINAL NEURALGIA

RADIOFREQUENCY

TABLE 108-2 ■ Complications in 1200 Patients after Percutaneous Radiofrequency Rhizotomy (Including Those Undergoing Multiple Percutaneous Radiofrequency Rhizotomies)

Complication	Patients (%)		
	Curved Electrode (500 Cases)	Straight Electrode (700 Cases)	Total (1200 Cases)
Dysesthesia	11	27	20
Minor	9	22	17
Major	2	5	3
Anesthesia dolorosa	0.2	1.6	1
Absent corneal reflex	3	8	6
With V1 pain	8	20	15
With V2 pain	2	8	5
With V3 pain	0.3	2	1
Keratitis	0.6	4	2
Masseter/pterygoid weakness*	7	24	16
Diplopia*	0.5	2	1.2
Oculomotor			0.1
Trochlear			0.5
Abducens			0.6
Meningitis			0.2
Carotid-cavernous fistula			0.1
Intracranial hemorrhage			0
Death			0

*Nearly all trigeminal motor root and extraocular nerve palsies represented axonotmesis and resolved within 6 to 12 months.

TABLE 108-3 ■ Results of Percutaneous Stereotactic Radiofrequency Rhizotomy in Series (Since 1989) of at least 100 Patients

Percentage (%)

Series	No. of Patients (n)	Follow-up (yr)	Long-Term Pain Relief	Significant Dysesthesia	Corneal Analgesia	Trigeminal Motor Weakness	Cranial Nerve Palsy	PO Morbidity	Severe PO Morbidity or Mortality
Fraioli et al ¹⁶	533	6.5	89	NR	3	3	0.2	0.2	0
Frank and Fabrizio ¹⁷	700	>3	75	NR	1	8	0.1	0.1	0
Miserocchi et al ¹⁸	111	1-7	80	6.3	2	NR	0	0	0
Broggi et al ¹⁹	1000	9	78	6.5	17	10	0.5	0.5	0
Sweet ²⁰	702	5.5	63	9	9	65	0.4	0.5	0
Ischia et al ²¹	124	3.7	67	6	2	3	4	NR	NR
Nugent ²²	1070	9	73	6.5	3.5	26	0.2	0.5	0.2
Zakrzewska and Thomas ²³	265	3.8	71	8	9	NR	NR	NR	0
Tew and Taha ²⁴	1200	9	79	4	6	16	1	1.3	0
Oturai et al ²⁵	185	1-16 (avg 8)	51	4	NR	NR	NR	NR	NR
Spendel et al ²⁶	182	0.5-10	95	NR	NR	NR	NR	NR	NR
Mathews and Scrivani ²⁷	258	1-6.5 (avg 3)	74	8	2.3	28.8	0	0	0
Kanpolat et al ²⁸	1600	1-5	75	1.8	5.7	4.1	0.13	1.6	0
Tronnier et al ²⁹	316	14	25	0.9	0	NR	0.8	NR	0.8

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TABLE 108-4 ■ Results of Glycerol Rhizotomy in Series of at least ~100 Patients Since 1989

Percentage (%)

Series	No. of Patients (n)	Follow-up (yr)	Long-Term Pain Relief	Significant Dysesthesia	Corneal Analgesia	Trigeminal Motor Weakness	Cranial Nerve Palsy	PO Morbidity	Severe PO Morbidity or Mortality
Bergenheim et al ³⁰	99	1	64	7	5	0	0	0	0
Young ³¹	162	0.5-5.5	63	3	2	0	0	0.6	0
Waltz et al ³²	200	—	55	2	NR	NR	0	NR	NR
Fujimaki et al ³³	122	4.5	22	13	0	0	0	0	0
Ischia et al ³⁴	112	3.5	73	3	8	0	0	0	0
De La Porte et al ³⁵	120	—	NR	0	2.5	0	NR	0	0
Steiger ³⁶	122	5	41	13	16	4	0	0	0.8
Cappabianca et al ³⁷	191	1-7	70	0	10	6	0	6	NR
Jho and Lunsford ³⁸	523	0.5-11	46	2	0	0	0	0	0
Hananson and Linderth ³⁹	100	5.4	57	0	0	0	0	0	0
Jho and Lunsford ⁴⁰	365	11	77	.2	0	NR	NR	0.6 (aseptic meningitis)	1
Erdem and Alkan ⁴¹	157	4	62	8.9	NR	NR	NR	NR	NR

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TABLE 108-5 ■ Results of Balloon Compression in Reported Series with at least 100 Patients

Percentage (%)

Series	No. of Patients (n)	Follow-up (yr)	Long-Term Pain Relief	Significant Dysesthesia	Corneal Analgesia	Trigeminal Motor Weakness	Cranial Nerve Palsy	PO Morbidity	Severe PO Morbidity or Mortality
Fraioli et al ¹⁶	159	3.5	81	7.6	NR	3	0	0	0
Frank and Fabrizio ¹⁷	212	<3	75	0	0	9	0.9	1.8	0
Lichter and Mullan ⁴³	100	1-10	78	4	0	0	0	2	0
Lobato et al ⁴⁴	144	0.5-4.5	83	3	0	12	2.8	4.8	0
Addenneibi et al ⁴⁵	200	4.2	68	10.6	3	7	0	NR	0.5
Brown and Gouda ⁴⁶	141	2	68	6	0	0	0	5	0
Correa and Teixeira ⁴⁷	158	5	70-80	15	0	33	1.9	1.3	0
Skirving and Dan ⁴⁸	496	10.7	68	3.8	0	3.4	1.6	0	0
Chen and Lee ⁴⁹	127	2	91	3.3	NR	NR	1.6	3.9	0

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TRIGEMINAL NEURALGIA



RADIOSURGERY

- ✓ 2003 – 12,560 (source: Leksell GNS)
- ✓ 2 years follow-up
- ✓ initial pain relief in 95,5%
- ✓ recurrences in 3,3%
- ✓ 3 weeks to pain relief (1 day to 20 months)

TRIGEMINAL NEURALGIA

RADIOSURGERY

- ✓ complications - dysesthesias 16,7% (70Gy)
32% (90Gy)
(may start up to 19 months, median 8)
 - dry eye syndrome 5%
 - impaired taste 4%