IV. ULUSAL DİYABETİK AYAK İNFEKSİYONLARI SİMPOZYUMU

5-7 MAYIS 2016
HİLTON İSTANBUL KOZYATAĞI

UDAİS
ULUSAL DİYABETİK AYAK İNFEKSİYONLARI SİMPOZYUMU

KLİMİK
TÜRK KLİNİK MİKROBİYOLOJİ VE İNFEKSİYON HASTALIKLARI DERNEĞİ

PERİFERİK NÖROPATİNİN TESPİTİ VE YÖNETİMİ

Doç. Dr. Hüseyin Karagöz

GATA Haydarpaşa Eğitim Hastanesi

Plastik, Rekonstrüktif ve Estetik Cerrahi Servisi

İSTANBUL

GİRİŞ

Epidemiyoloji

DIABETES RESEARCH AND CLINICAL PRACTICE 103 (2014) 137–149

Contents available at ScienceDirect

Diabetes Research and Clinical Practice

journal homepage: www.elsevier.com/locate/diabres

IDF Diabetes Atlas

Global estimates of diabetes prevalence for 2013 and projections for 2035

L. Guariguata [a,], D.R. Whiting [b], I. Hambleton [c], J. Beagley [a], U. Linnenkamp [a], J.E. Shaw [d]*

[a] *International Diabetes Federation, Brussels, Belgium*
[b] *Directorate of Public Health, Medway Council, Chatham, United Kingdom*
[c] *University of the West Indies, Cave Hill, Barbados*
[d] *Baker IDI Heart and Diabetes Institute, Melbourne, Australia*

representing 130 countries. These data produced an estimate of 381.8 million adults in 219 countries and territories with diabetes for 2013; and projected the number to rise to 591.9 million in 2035. The estimates derived from these sources for the 80 most populous countries (with adult populations greater than 6.5 million) are presented in Table 1 and the increase in the numbers of adults with diabetes by 2035, with an increase of 109%. All regions are projected to have an increase in the numbers of people with diabetes larger than those projected for growth in the adult population alone. Overall, the numbers of adults with diabetes will increase by 55% by 2035.

GİRİŞ

Epidemiyoloji

DIABETES RESEARCH AND CLINICAL PRACTICE 103 (2014) 137–149

Contents available at ScienceDirect

Diabetes Research and Clinical Practice

journal homepage: www.elsevier.com/locate/diabres

IDF Diabetes Atlas

Global estimates of diabetes prevalence for 2013 and projections for 2035

L. Guariguata [a,], D.R. Whiting [b], I. Hambleton [c], J. Beagley [a], U. Linnenkamp [a], J.E. Shaw [d]*

[a] *International Diabetes Federation, Brussels, Belgium*
[b] *Directorate of Public Health, Medway Council, Chatham, United Kingdom*
[c] *University of the West Indies, Cave Hill, Barbados*
[d] *Baker IDI Heart and Diabetes Institute, Melbourne, Australia*

Country/territory	Prevalence adjusted to the national population (%)		Prevalence adjusted to the world population[a] (%)		Diabetes cases (20–79) in 1000s		Mean annual increment (000s)	Proportional change in adult population from 2013 to 2035 (%)	Proportional change in number of people with diabetes from 2013 to 2035 (%)
	2013	2035	2013	2035	2013	2035			
Spain	10.8	14.4	8.2	8.3	3791	5179	63	2.8	36.6
Sweden	6.4	6.6	4.7	4.7	439	498	3	8.7	13.5
Turkey	14.6	18.5	14.9	15.1	7043	11,786	216	32.3	67.3
Ukraine	3.0	3.4	2.5	2.5	1044	969	−3	−17.6	−7.2
United Kingdom	6.6	7.4	4.9	5.0	2975	3619	29	8.5	21.7
Uzbekistan	5.0	7.1	6.4	6.5	881	1734	39	39.1	96.9

GİRİŞ

Epidemiyoloji

Madanchi *et al. Journal of Diabetes & Metabolic Disorders* 2013, **12**:36
http://www.jdmdonline.com/content/12/1/36

Journal of Diabetes & Metabolic Disorders

RESEARCH ARTICLE Open Access

Who are diabetic foot patients? A descriptive study on 873 patients

Nima Madanchi[1], Ozra Tabatabaei-Malazy[1], Mohammad Pajouhi[1], Ramin Heshmat[1], Bagher Larijani[1] and Mohammad-Reza Mohajeri-Tehrani[1,2*]

(DFU). Development of DFU is traditionally believed to result from a combination of oxygen deficiency caused by peripheral vascular disease, peripheral neuropathy, minor foot traumas, foot deformities, and infection [1-3]. DFU, with a lifetime development risk of 15% [4], incidence of 1–4%, and prevalence of 5.3% to 10.5% [5,6] in all diabetic patients, accounts for more than half of the non-traumatic lower-extremity amputations in the world [7-11]. Globally, one lower limb is lost every 30 seconds because of DFU [12]. The range of mortality following diabetic foot amputation is 39–80% after 5 years, which is worse than the mortality rate for most malignancies [5]. Approximately, 20% of hospital admissions among diabetic patients are in consequence of foot problems [13]. Furthermore, DFU is among the most prevalent causes of hospitalization and morbidity [10,14] and is responsible for more days of hospital stay than any other chronic complication of DM [15,16].

tients were utilized and necessary data was collected using a predesigned data collection sheet. The information was thereafter entered into SPSS software, version 15, for analysis. The data collected comprised information on the patient's age and sex, family history of DM, duration of DM and DFU, method of DM control, history of lower-limb amputation, history of previous hospitalizations, location of the foot ulcer, type of the foot ulcer, side of the foot ulcer (right or left limb), co-morbidities found during admission, laboratory data, duration of hospitalization, and the outcome.

We defined renal co-morbidity as presence of micro-albuminuria, macro-albuminuria, or end-stage renal disease; cardiovascular co-morbidity as presence of hypertension or ischemic heart disease; ophthalmic co-morbidity as presence of simple or proliferative diabetic retinopathy or cataract. We considered sensorimotor neuropathy in case of paresthesia, loss or reduction of vibration, pressure, temperature or

GİRİŞ

Diyabetik nöropati

- Hastaların %60'ı
- Simetrik, distal,
- sensorimotor polinöropati
- İlerleyici ve geri dönüşümsüz

NÖROPATİ

Tanı

Anamnez ve nörolojik muayene (semptom ve bulgular)

Elektromyografi ve sinir ileti testleri

Diğer olası sebeplerin ekarte edilmesi

GİRİŞ

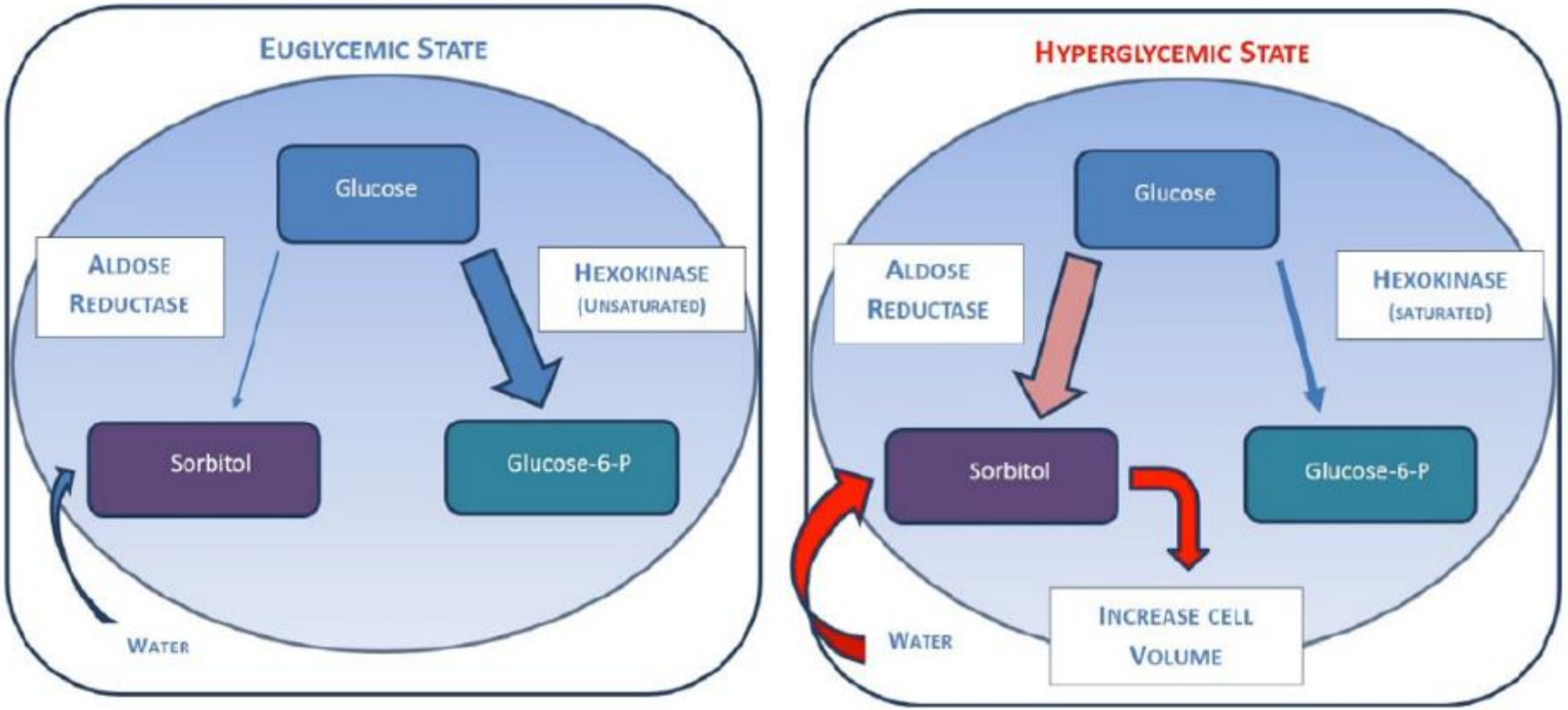
Sonuçlar

- Ülserasyon
- Enfeksiyon
- Amputasyon

NÖROPATİ

Fizyopatoloji

1. İntranöral basınç artışı

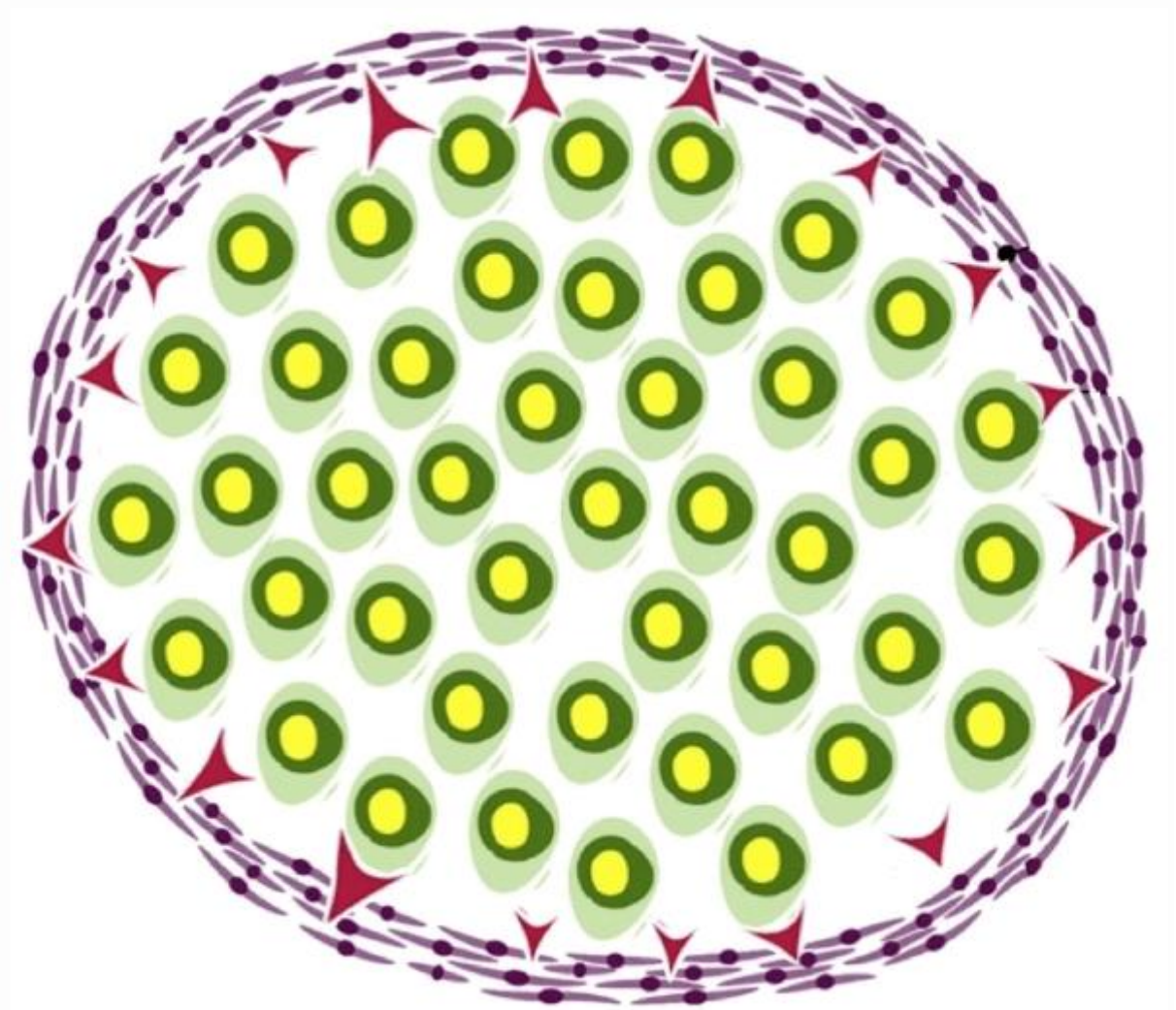


Sessions J, Nickerson DS.
Biologic basis of nerve decompression surgery for focal entrapments in diabetic peripheral neuropathy.
*J Diabetes Sci Technol 8(2):412-418**, 2014.***

NÖROPATİ

Fizyopatoloji

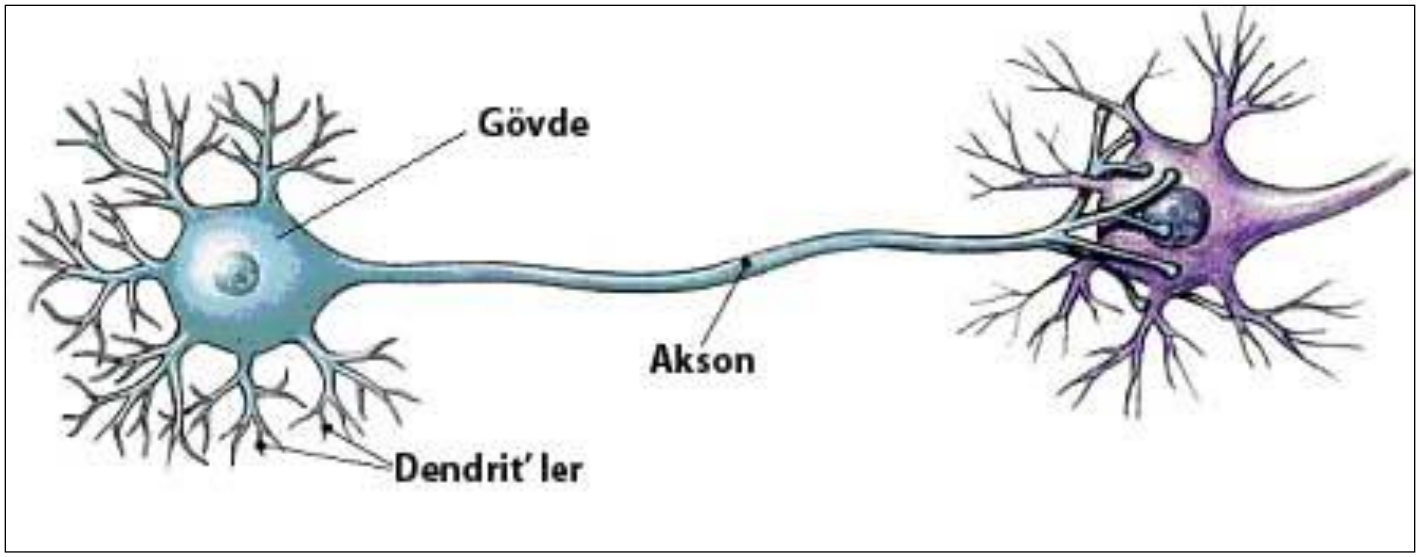
1. İntranöral basınç artışı



NÖROPATİ

Fizyopatoloji

2. Aksoplazmik transportta bozulma



3. Sinirin dokusunda bozulma (sertleşme)

Enzimatik olmayan kollajen bağlanması

Sessions J, Nickerson DS.
Biologic basis of nerve decompression surgery for focal entrapments in diabetic peripheral neuropathy.
*J Diabetes Sci Technol 8(2):412-418**, 2014.***

NÖROPATİ

Bilimsel çalışmalar

Hypothesis

THE DOUBLE CRUSH IN NERVE-ENTRAPMENT SYNDROMES

ADRIAN R. M. UPTON ALAN J. MCCOMAS

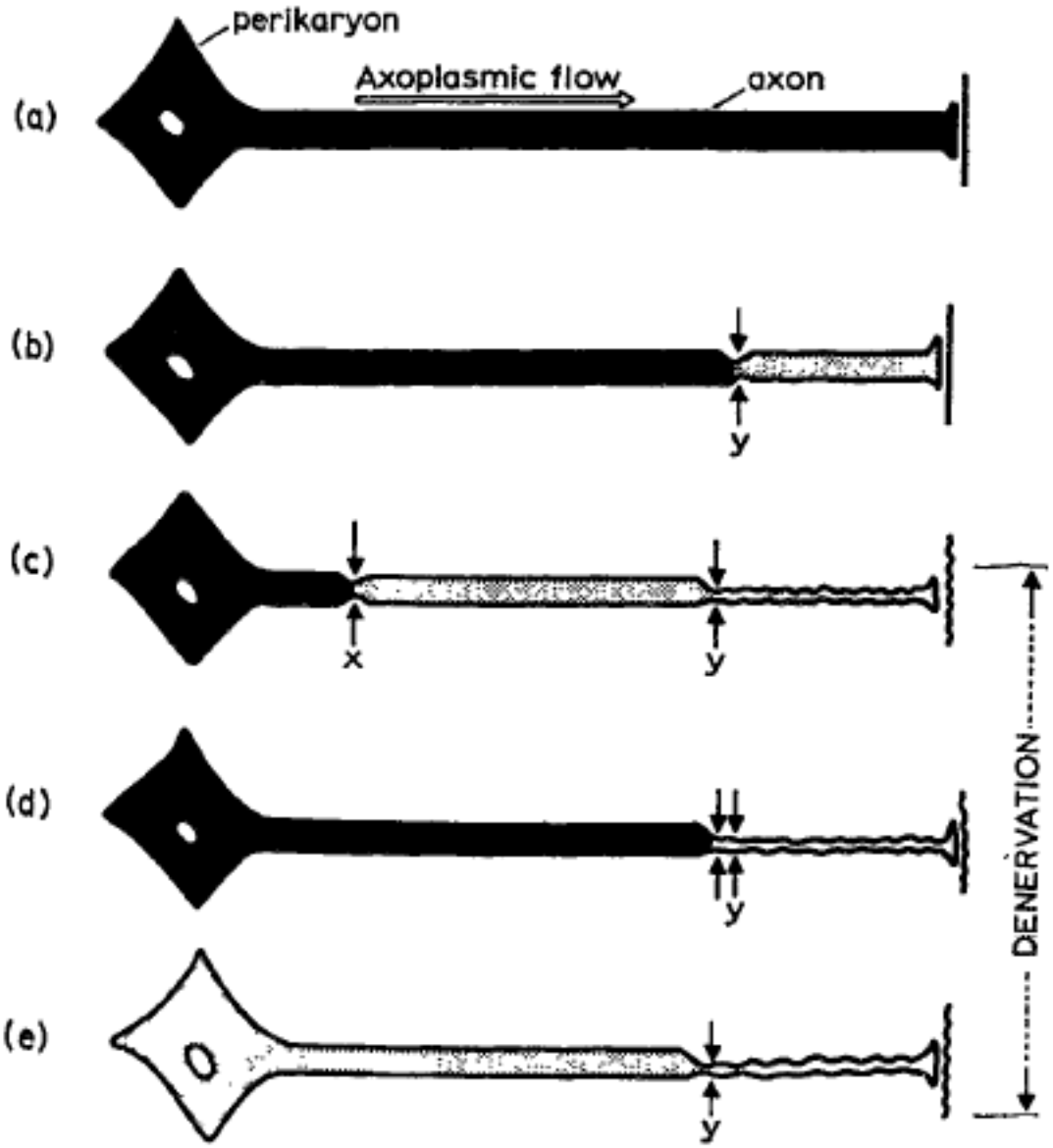
Department of Medicine (Neurology), McMaster University Medical Centre, Hamilton, Ontario, Canada

Summary A comprehensive electromyographic study has been made of 115 patients with carpal-tunnel syndromes or lesions of the ulnar nerve at the elbow. In 81 cases there was electrophysiological evidence, often supported by clinical symptoms, of associated neural lesions in the neck. This association is not thought to be fortuitous, but rather the result of serial constraints of axoplasmic flow in nerve fibres.

Upton AR, McComas AJ.
The double crush in nerve entrapment syndromes. Lancet 2:395-362, **1973.**

NÖROPATİ

Bilimsel çalışmalar



Upton AR, McComas AJ.
The double crush in nerve entrapment syndromes. Lancet 2:395-362, **1973.**

NÖROPATİ

Bilimsel çalışmalar

Susan E. Mackinnon

Chronic Nerve Compression—an Experimental Model in the Rat

Susan E. Mackinnon, M.D.,*
A. Lee Dellon, M.D.,†
Alan R. Hudson, M.B.,*
and Daniel A. Hunter, R.T.*

Although nerve entrapments are a common clinical problem, a clear understanding of both the pathophysiological and morphological changes associated with this syndrome is lacking. Controversy still exists regarding appropriate treatment methods. This study was undertaken to develop a model of chronic nerve compression in the rat.

Material and Methods

Surgical Procedures

Adult male Sprague-Dawley rats (250 to 300 gm) were

Ann Plast Surg 13:112-120, 1984.

NÖROPATİ

Bilimsel çalışmalar

A. Lee Dellon

Susceptibility of the Diabetic Nerve to Chronic Compression

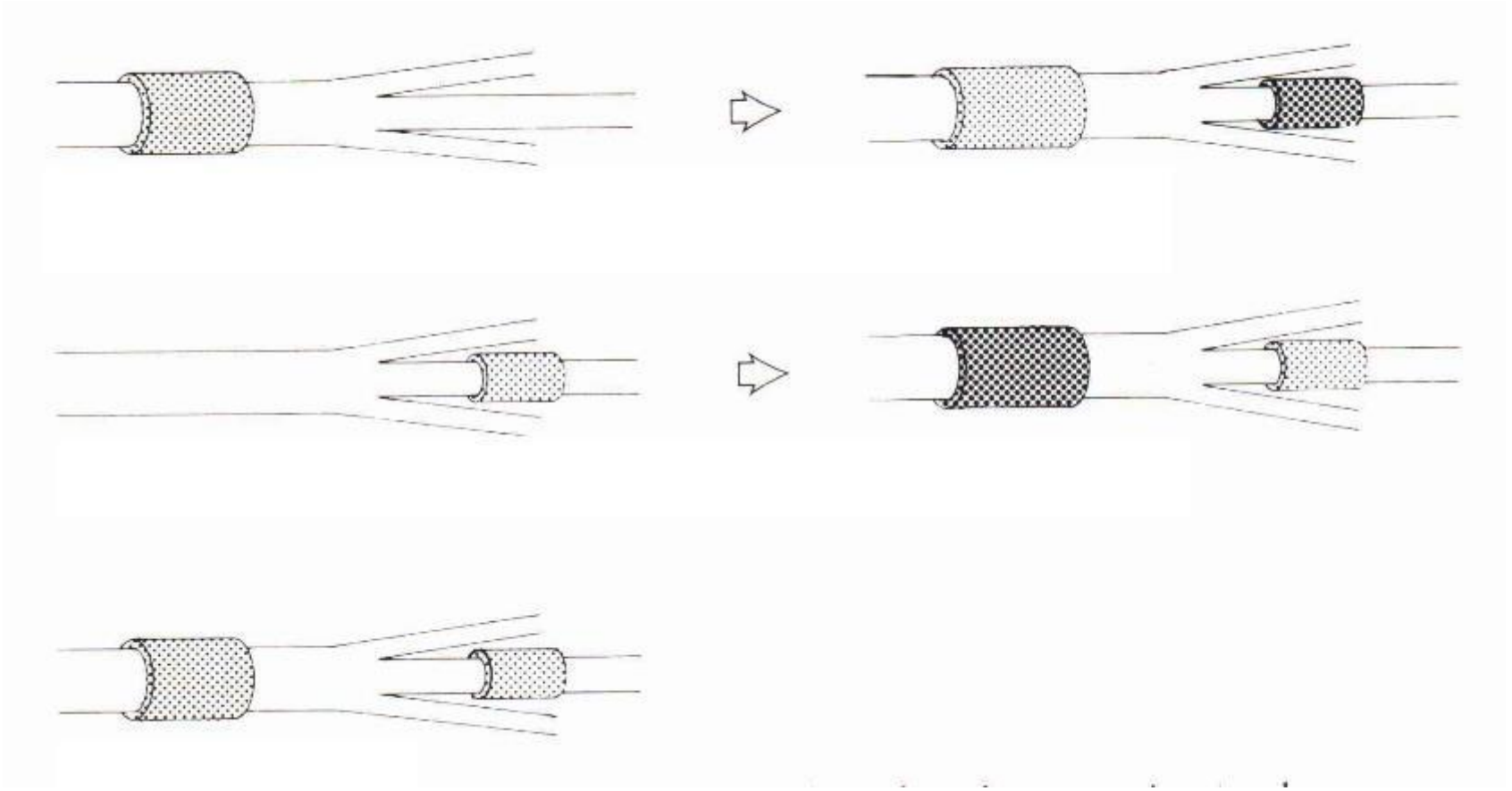
A. Lee Dellon, M.D.*
Susan E. Mackinnon, M.D.†
William A. Seiler IV, B.A.‡

Although mononeuritis and mononeuritis multiplex are prevalent in the diabetic [3, 9, 12], the hypothesis that diabetes predisposes the peripheral nerve to chronic compression has not been investigated. Ensheathment of a nerve with a Silastic tube, whose internal diameter matches the diameter of the nerve, has proved to be a valid model of chronic compression neuropathy for the rat sciatic nerve [6] and the primate median nerve [7]. To determine whether a dia-

Ann Plast Surg 20:117-119, 1988.

NÖROPATİ

Bilimsel çalışmalar



Dellon AL, Mackinnon SE.

Chronic nerve compression model for the double crush hypothesis.

Ann Plast Surg 26:259-264, **1991.**

NÖROPATİ

Hipotez

Editorial

A Cause for Optimism in Diabetic Neuropathy

A. Lee Dellon, M.D.

The hypothesis is that the majority of the symptoms of diabetic neuropathy are due to multiple peripheral nerve entrapments. This hypothesis assumes that the underlying metabolic problem—hyperglycemia—makes the peripheral nerve more susceptible to compression at normal anatomic areas of narrowing, such as the carpal, cubital, and tarsal tunnels. If this hy-

Ann Plast Surg 20:103-105, 1988.

NÖROPATİ

Hipotez

- Diyabet hastaların kronik periferik sinir kompresyonuna eğilimleri vardır ve kompresyona daha duyarlıdırlar

- Kompresyon diyabetik sinirde “double-crush” etkisine neden olur

- Kompresyonun ortadan kaldırılması durumunda nöropatinin geri dönüşlü olan kısmının düzelmesi gerekir

Dellon AL.
A cause for optimism in diabetic neuropathy.
*Ann Plast Surg 20:103-105**, 1988.***

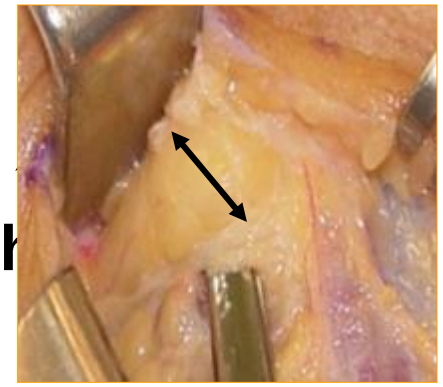
NÖROPATİ

Fizyopatoloji

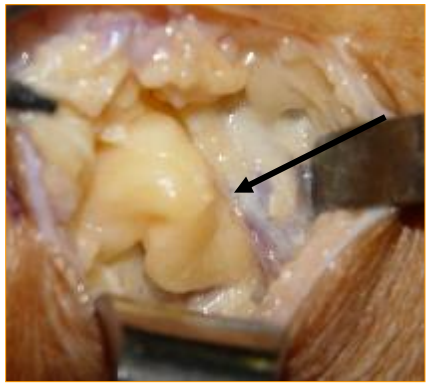
- **İntranöral basınç artışı**

Glukoz → *Fruktoz* → *Sorbitol*

“ Double Crush



- **Ağrı**
- ✓ **Sızlama**
- ✓ **Yanma**
- ✓ **Duyu kaybı**



✓ *Kan akımı yavaşlaması*

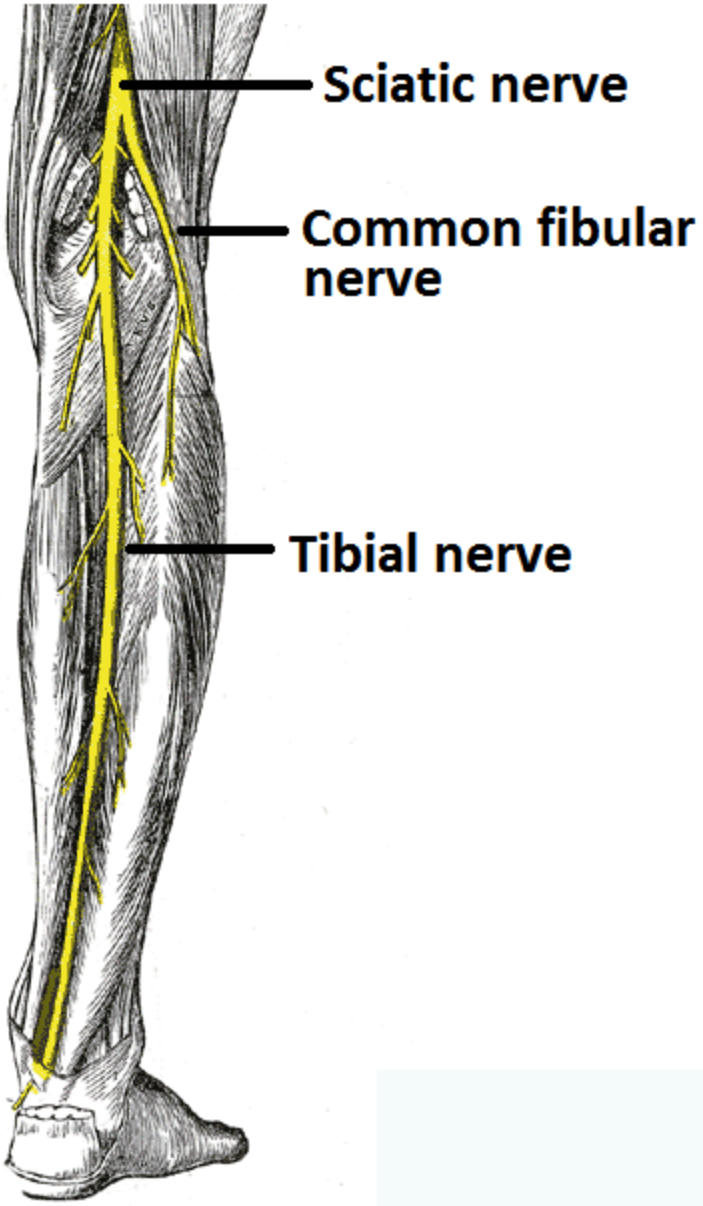
✓ *Membran onarımının bozulması*

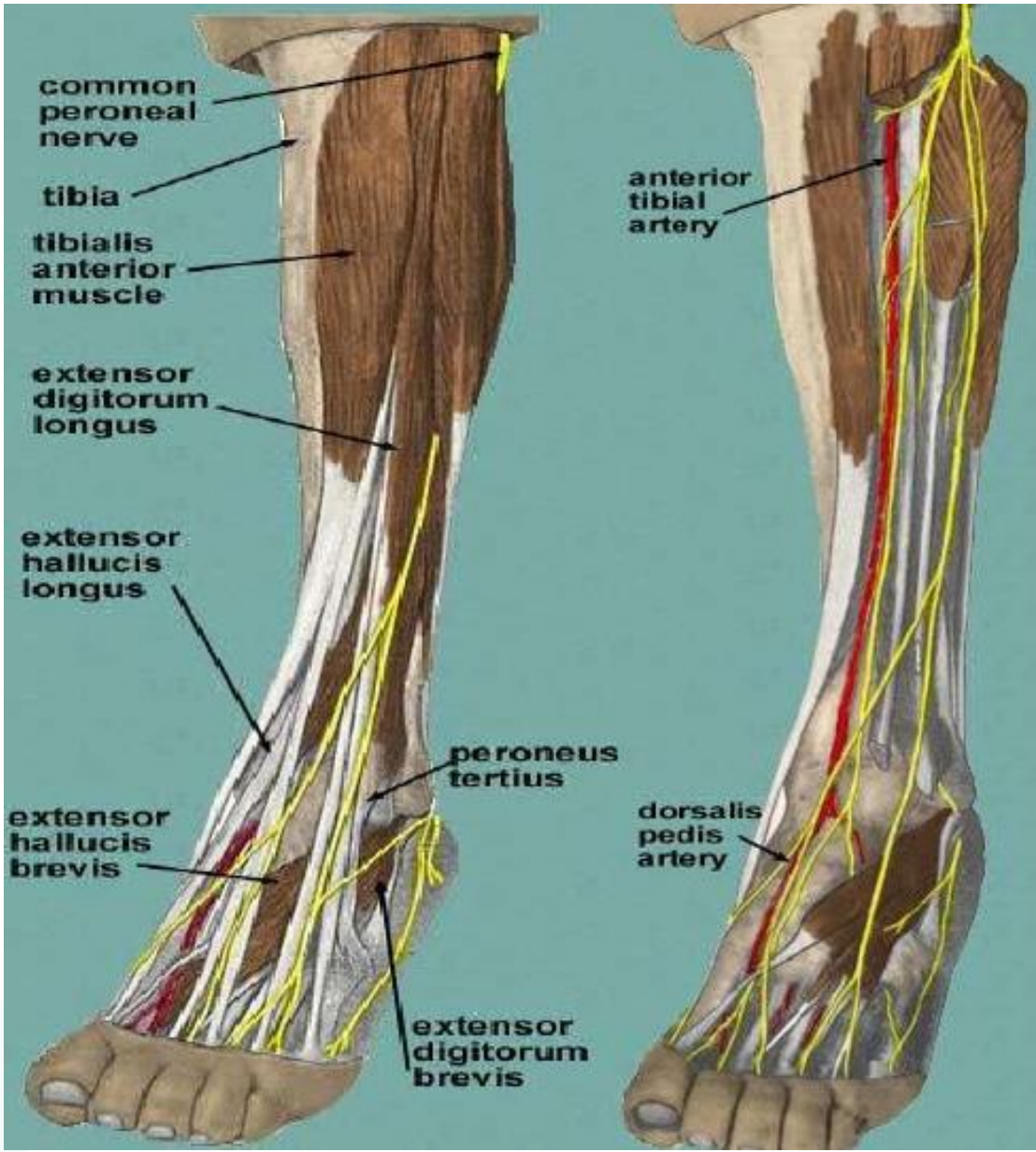
NÖROPATİ

- **Diyabetik nöropati**

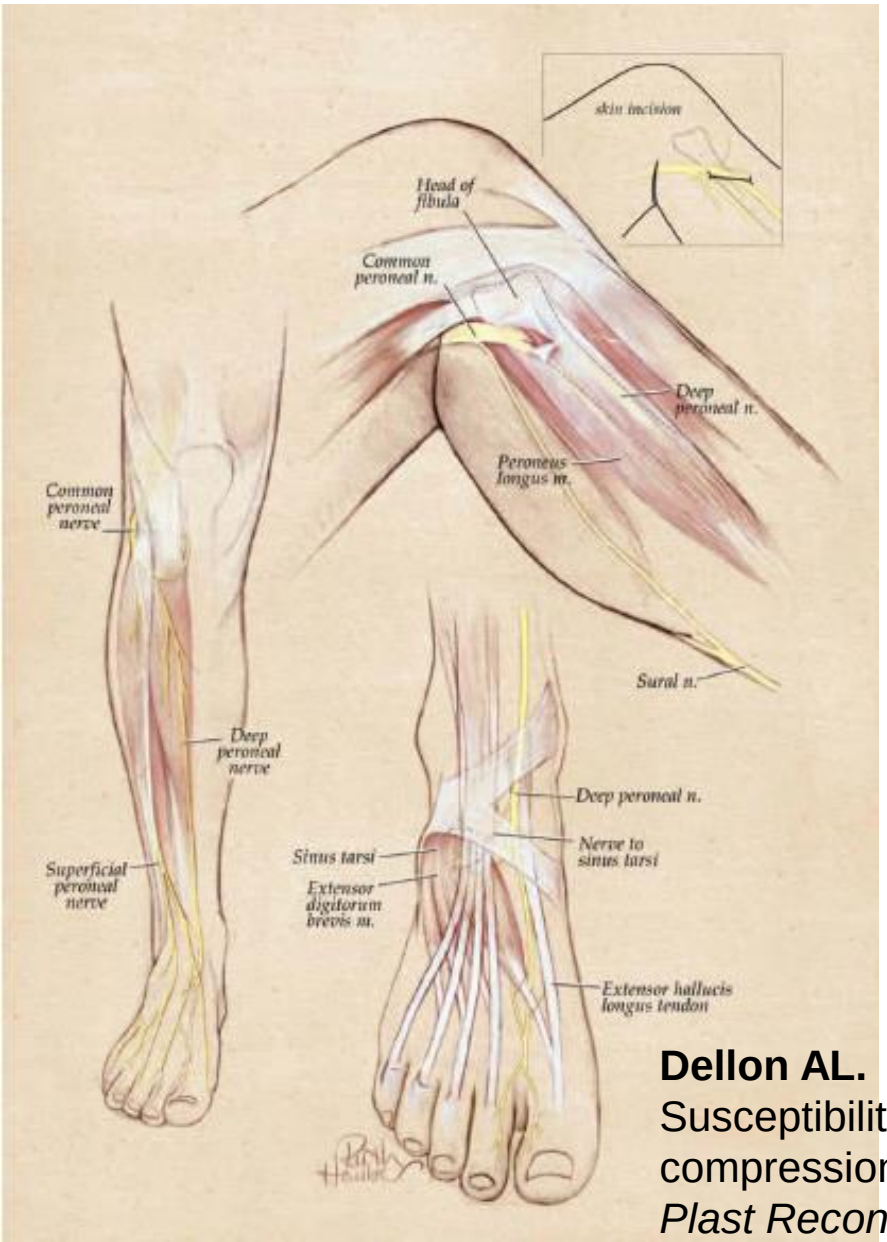
  İlerleyici ve geri dönüşümsüz ?

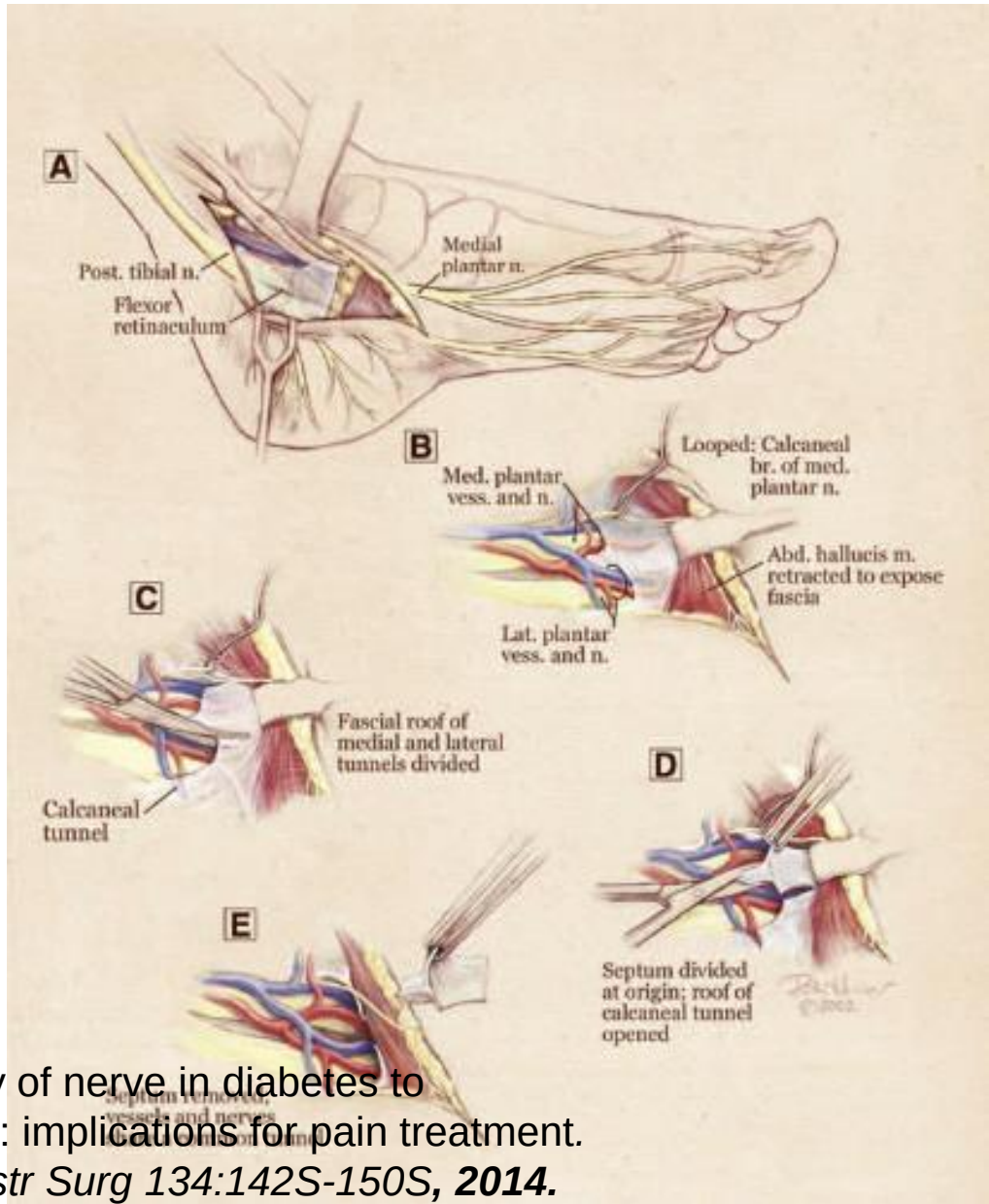
ANATOMİ


Sciatic nerve
Common fibular nerve
Tibial nerve


common peroneal nerve
tibia
tibialis anterior muscle
extensor digitorum longus
extensor hallucis longus
peroneus tertius
extensor hallucis brevis
extensor digitorum brevis
anterior tibial artery
dorsalis pedis artery

ANATOMİ





Dellon AL.
Susceptibility of nerve in diabetes to compression: implications for pain treatment.
Plast Reconstr Surg 134:142S-150S, ***2014.***

CERRAHİ YÖNTEM

sinir serbestleştirme

Plast Reconstr Surg. 1992 Apr;89(4):689-97; discussion 698-9.

Treatment of symptomatic diabetic neuropathy by surgical decompression of multiple peripheral nerves.

Dellon AL[1].

Author information

Abstract

Symptomatic diabetic sensorimotor polyneuropathy is considered progressive and irreversible. The hypothesis that symptoms of diabetic neuropathy may be due to entrapment of peripheral nerves was investigated in a prospective study from 1982 to 1988 in which diabetics (38 type I, 22 type II) had surgical decompression of 154 peripheral nerves in 51 upper extremities and 31 lower extremities. Mean postoperative follow-up was 30 months (range 6 to 83 months). Considering the entire series, an excellent final result was noted for motor function in 44 percent and for sensory function in 67 percent of the decompressed nerves. Ten percent of the patients were not improved, and 2 percent were worse in sensorimotor function. Upper extremity nerve decompressions achieved better results than lower extremity nerve decompressions. Improvement in postoperative electrodiagnostic studies varied in relationship to the preoperative electrodiagnosis. Improvement was noted in 100 percent of those nerves with the preoperative diagnosis of "localized entrapment," 80 percent for "peripheral neuropathy with superimposed entrapment," and 50 percent for "peripheral neuropathy." Progressive neuropathy occurred in a nontreated limb of 50 percent of those patients whose surgically treated limb maintained improvement. The results of this study suggest that symptoms of sensorimotor diabetic neuropathy may be due partly to compression of multiple peripheral nerves. The results further suggest that surgical decompression of such nerves may result in symptomatic improvement.

KLİNİK SONUÇLAR

Çalışma	Hasta sayısı	Sinir sayısı	Ağrı düzelme oranı	Duyu düzelme oranı
Dellon, 1992	22	31	% 85	% 72
Caffee, 2000	36	58	% 86	-
Aszmann, 2000	12	16	-	% 69
Wood, 2003	33	33	% 90	% 70
			% 87	% 70, 3

GÜNLÜK PRATİK

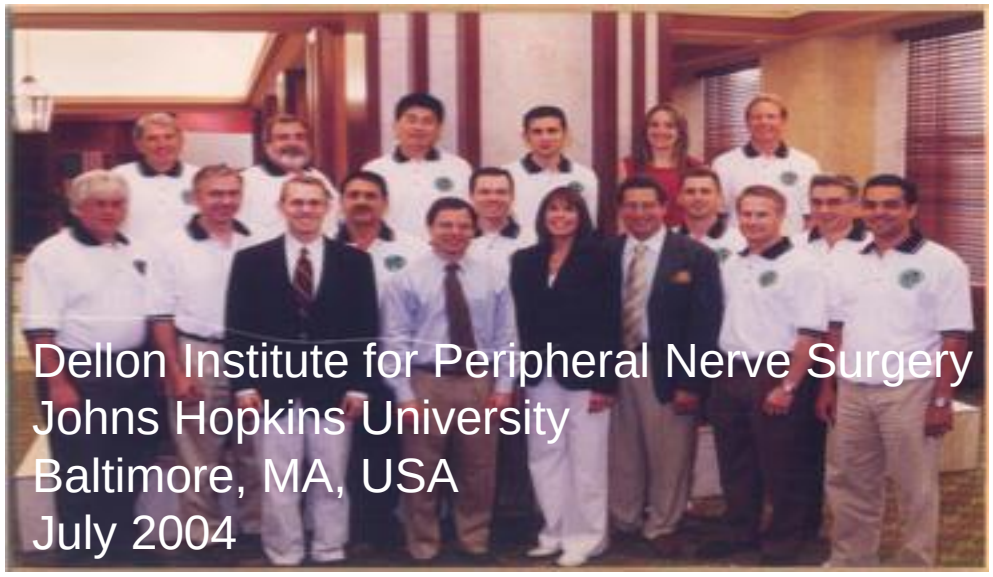
Diyabetik ayak kurulu

GÜNLÜK PRATİK

Diyabetik ayak kurulu

WORKSHOP

Peripheral Nerve Surgery



AMAÇ

- Ağrının giderilmesi
- Duyu restorasyonu
- Ülserin ve nihayi olarak amputasyonun önlenmesi

PREOP DEĞERLENDİRME

- Palpasyon
- “Ankle – brachial index”
- Doppler USG
- Tc PO_2

} İskemi (-)

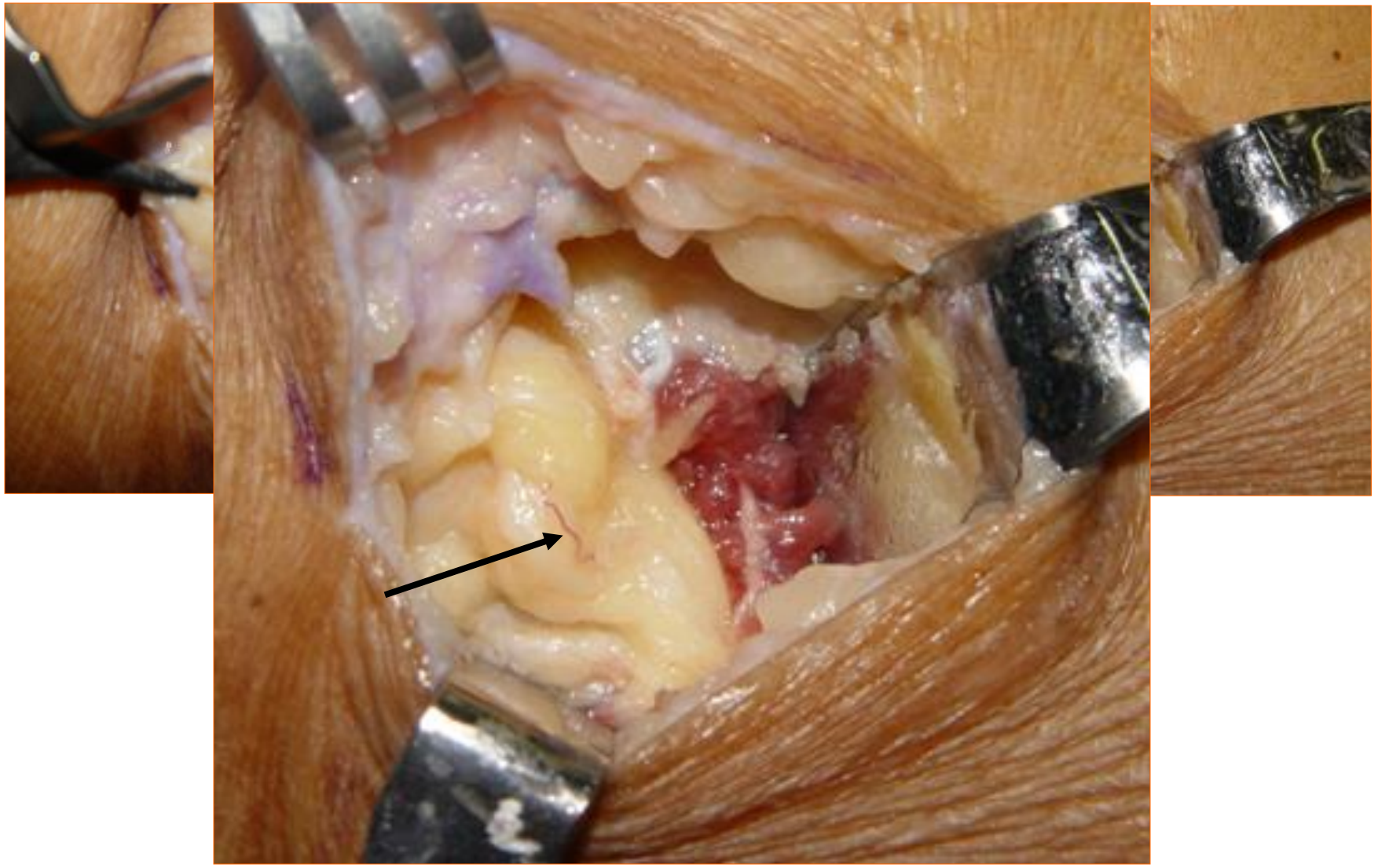
Tinel (+)

CERRAHİ TEKNİK

“Common” peroneal sinir

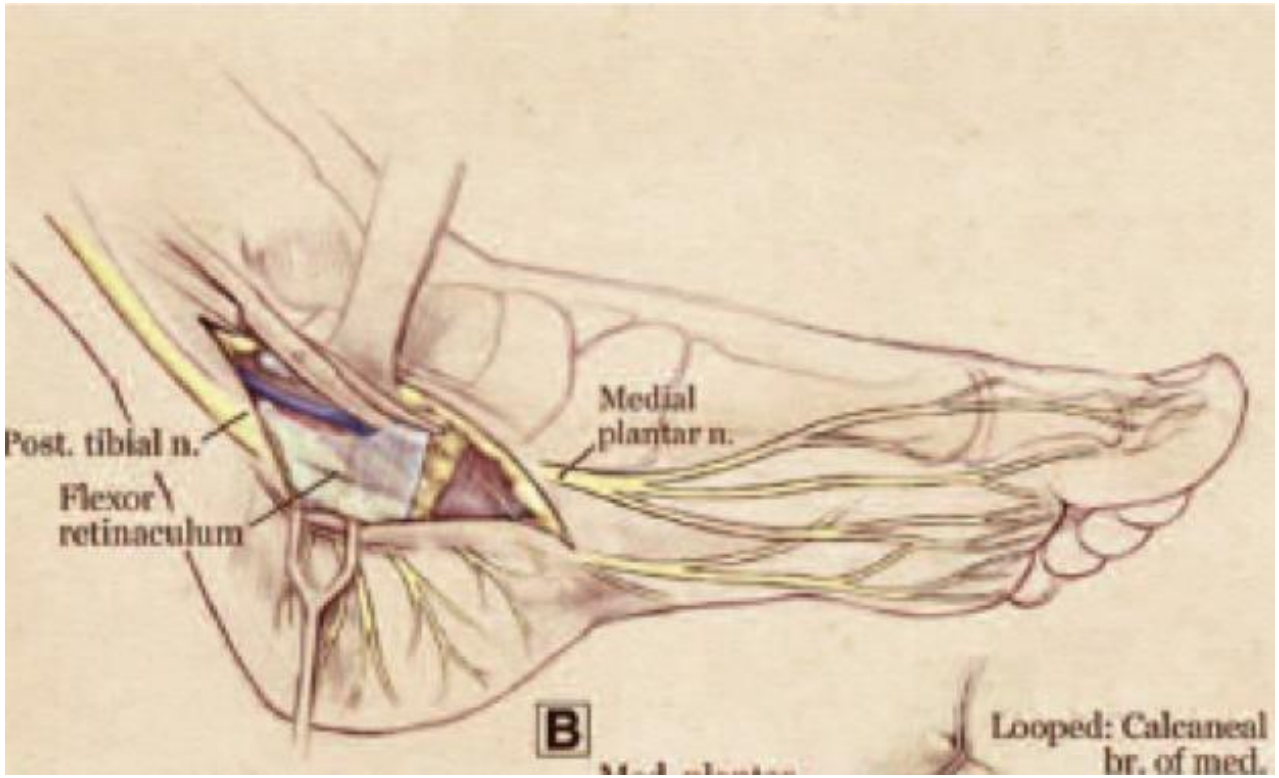
CERRAHİ TEKNİK

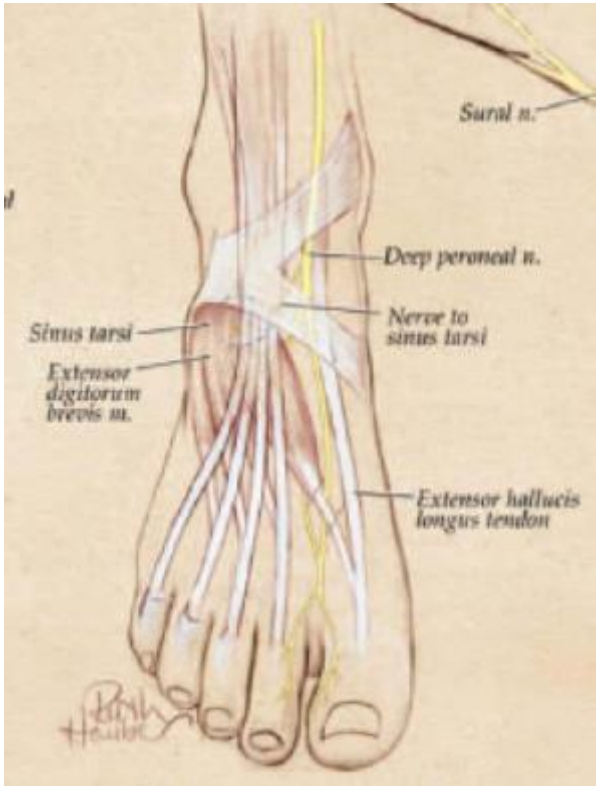
“Common” peroneal sinir



CERRAHİ TEKNİK

Tibial & Derin *peroneal sinir*





KLİNİK SONUÇLAR

Early and Late Results of Nerve Decompression Procedures in Diabetic Neuropathy: A Series from Turkiye

Huseyin Karagoz, M.D.,[1] Fuat Yuksel, M.D.,[2] Ersin Ulkur, M.D.,[2] and Bahattin Celikoz, M.D.[2]

ABSTRACT

We researched the effect of nerve decompression procedures on diabetic neuropathy cases just in the following day after surgery as well as later, at 6 months. Twenty-four patients with diabetic neuropathy who underwent surgical decompression were entered into this study. The common peroneal, the posterior tibial, and the deep peroneal nerves were decompressed. Visual analog scale was used for management of the pain. Patients were screened with neurosensory testing by using a Pressure-Specified Sensory Device. Preoperative values as well as values on the postoperative first day and 6 months postoperatively were compared. We found pain relief rate to be 80% at postoperative first day and 85% at 6 months postoperatively. Mean two-point discrimination length improvement rates were found to be 72.6% at postoperative first day and 89% at 6 months postoperatively, which mean excellent and good improvement. We concluded that peripheral nerve decompression can be used effectively in the treatment of diabetic neuropathy patients.

J Reconstr Microsurg 24(2):95-101, **2008.**

KLİNİK SONUÇLAR

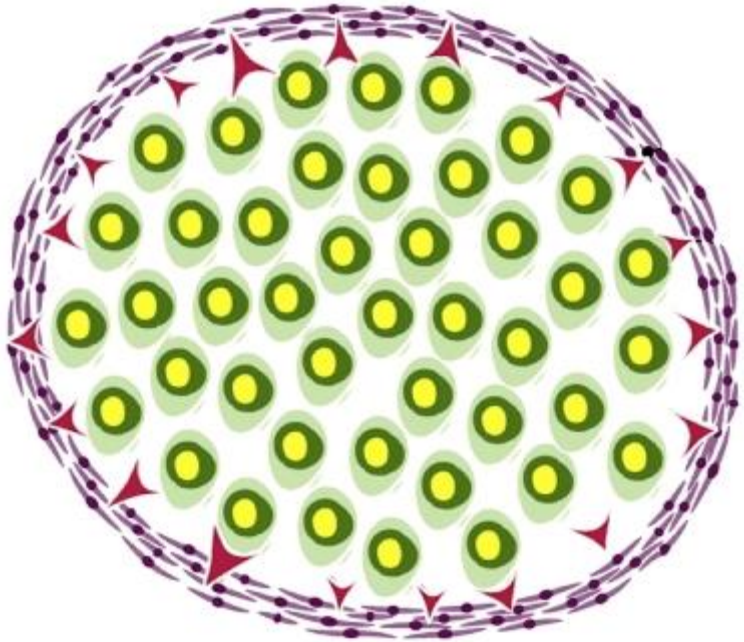
Çalışma	Hasta sayısı	Sinir sayısı	Ağrı düzelme oranı	Duyu düzelme oranı
Dellon, 1992	22	31	% 85	% 72
Caffee, 2000	36	58	% 86	-
Aszmann, 2000	12	16	-	% 69
Wood, 2003	33	33	% 90	% 70
			% 87	% 70, 3
		Postoperatif 1. gün	% 80	% 72, 6
		Postoperatif 6. ay	% 85	% 89

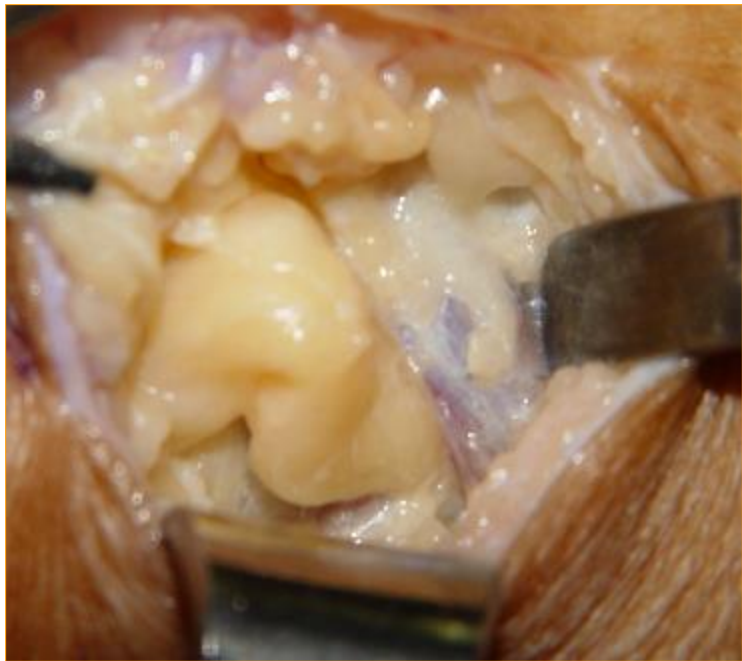
NÖROPATİ

“double-crush”

- Artmış endonöral basınç
- Dış bası

“Double-Crush”





DENEYSEL ÇALIŞMALAR

Experimental

Effect of Various Nerve Decompression Procedures on the Functions of Distal Limbs in Streptozotocin-Induced Diabetic Rats: Further Optimism in Diabetic Neuropathy

Bülent Kale, M.D., Fuat Yüksel, M.D., Bahattin Çeliköz, M.D., Serap Sirvanci, M.D., Özge Ergün, M.D., and Serap Arbak, M.D.

Istanbul, Turkey

It is known that diabetic neuropathy is the result of endoneurial edema caused by various biochemical reactions triggered by hyperglycemia. This sequence of events can cause cessation of circulation at the perineurial level, or the tough layer, which is not resilient enough to spread intraneural pressure. Internal and external limiting structures create a double crush phenomenon to the nerve structure. Decompression of the nerve trunk at separate levels is one of the adjuncts to the overall treatment plan for diabetic neuropathy.

The principal reason for the increased susceptibility of diabetic patients to the formation of foot ulcers is not ischemia but, rather, neuropathy through both motor and sensory impairment. Although the underlying mechanism for the peripheral nerve lesion in diabetes is not fully understood, it is known to be a condition that is slowly progressive and

Plast Reconstr Surg 111:2265, **2003.**

DENEYSEL ÇALIŞMALAR

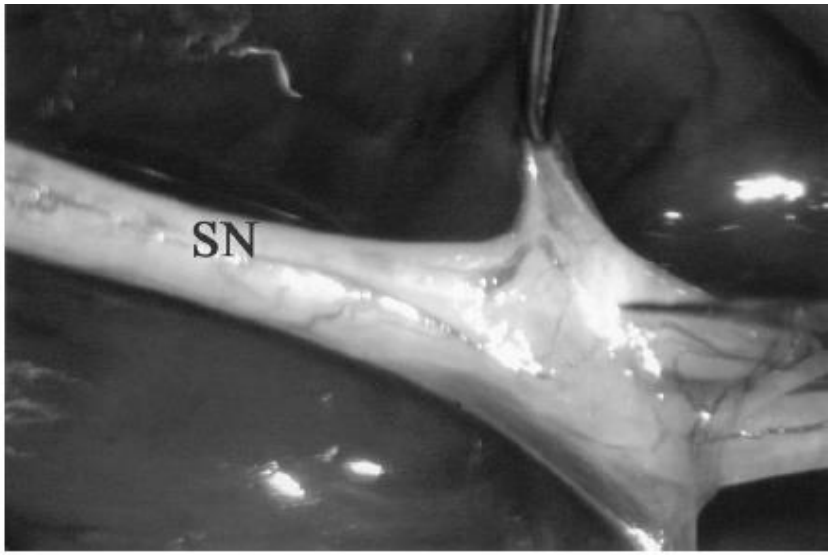
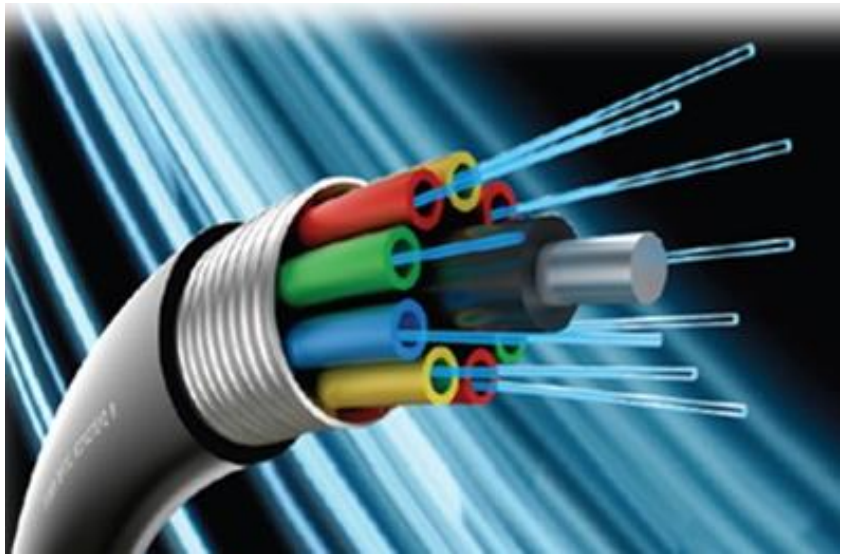
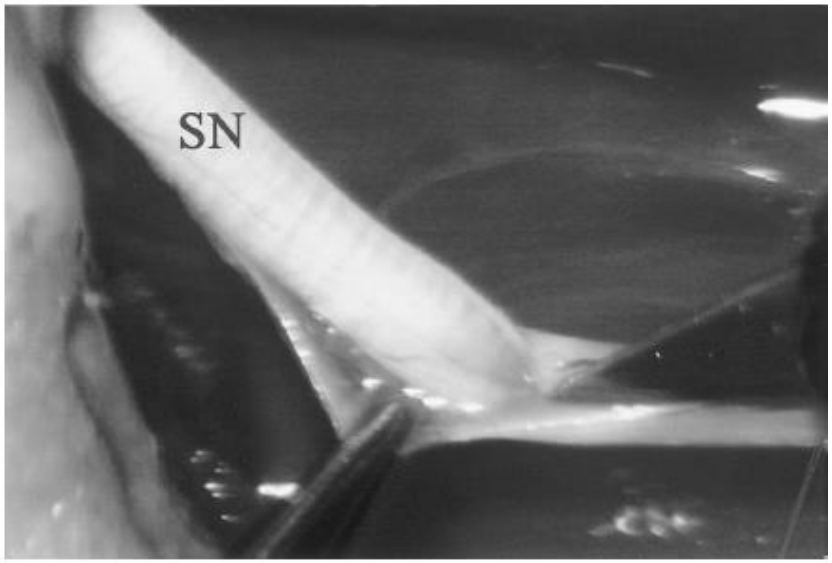
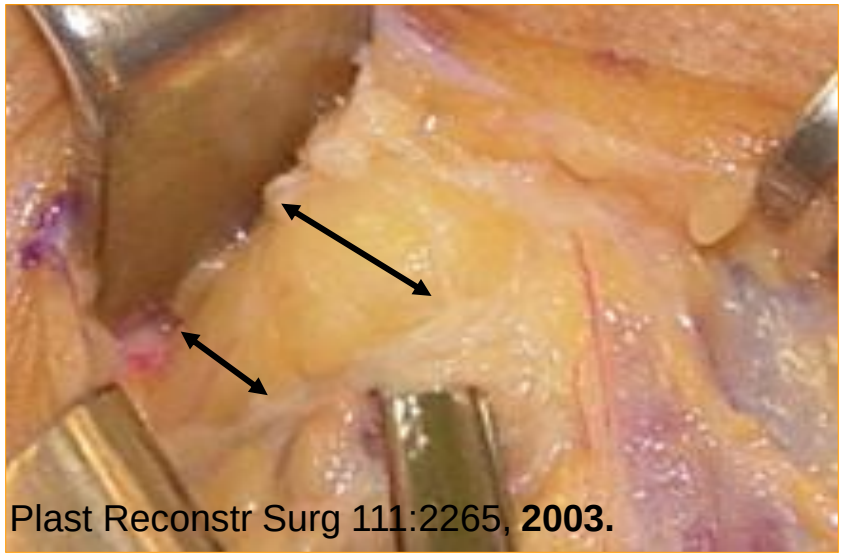


FIG. 2. Epineurotomy; *SN*, sciatic nerve.







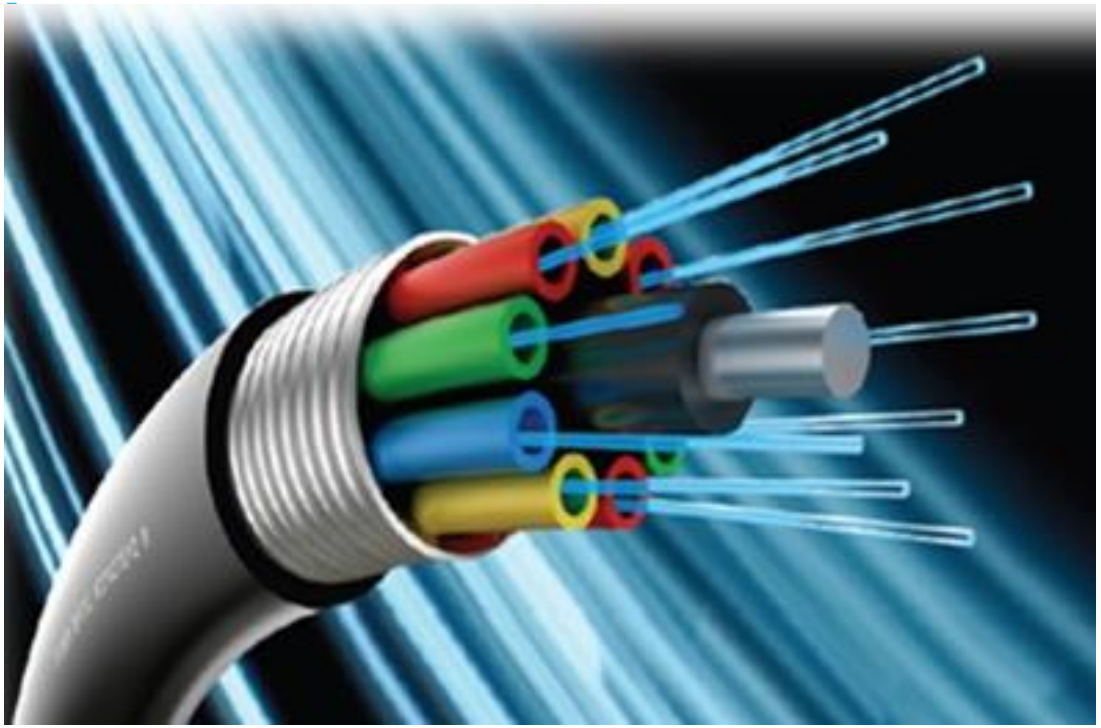
Plast Reconstr Surg 111:2265, **2003.**

DENEYSEL ÇALIŞMALAR

EXPERIMENTAL

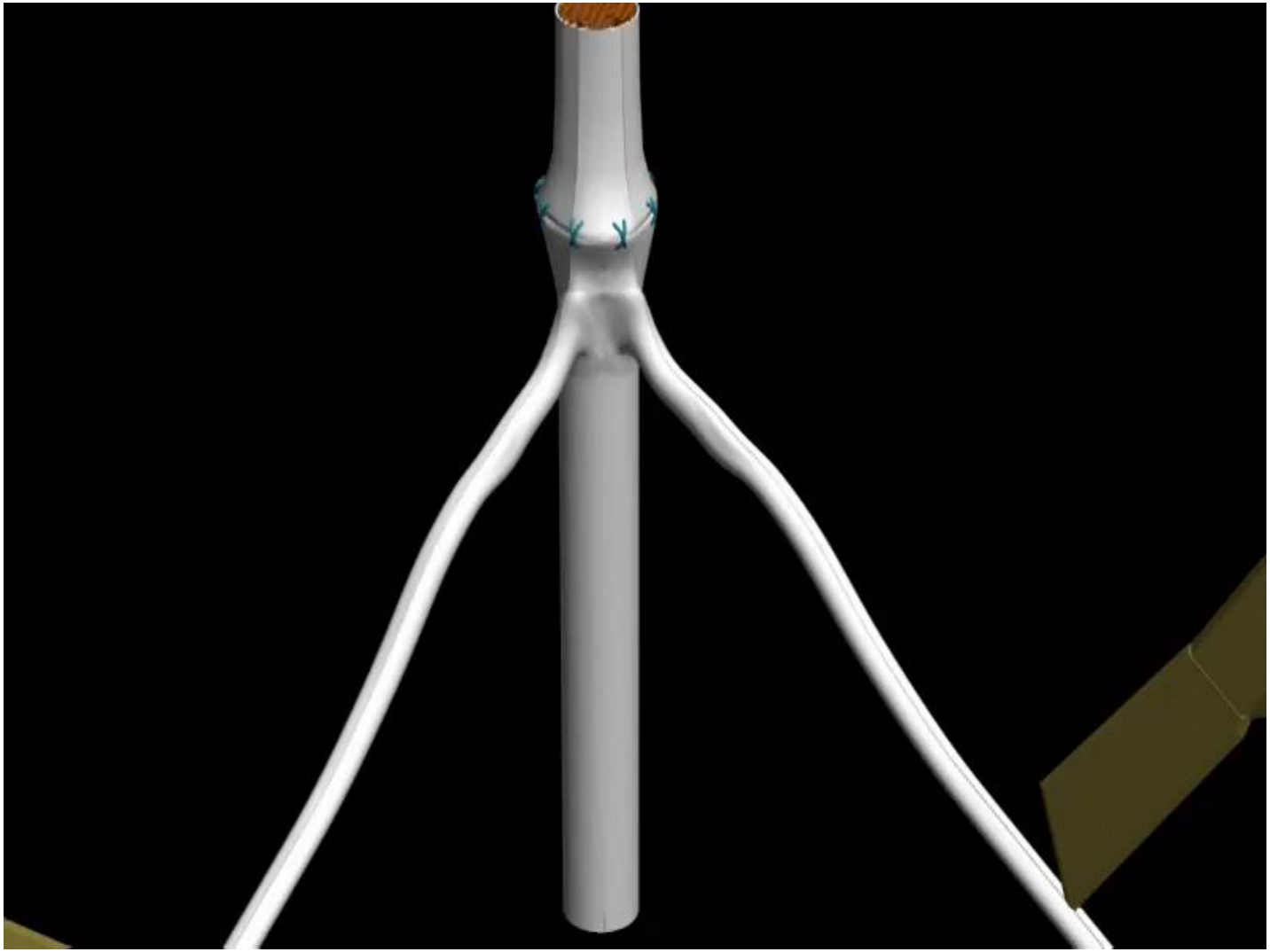
The Effect of Perineurotomy on Nerve Regeneration in Diabetic Rats

Cihan Sahin, M.D.
Huseyin Karagoz, M.D., Ph.D.
Fuat Yuksel, M.D.
Yalcin Kulahci, M.D.
Dilek Akakin, M.D.
Nukhet Dagbasi, M.D.
Celalettin Sever, M.D.
Ersin Ulkur, M.D.
Istanbul, Turkey



Plast Reconstr Surg 130:651e, **2012.**

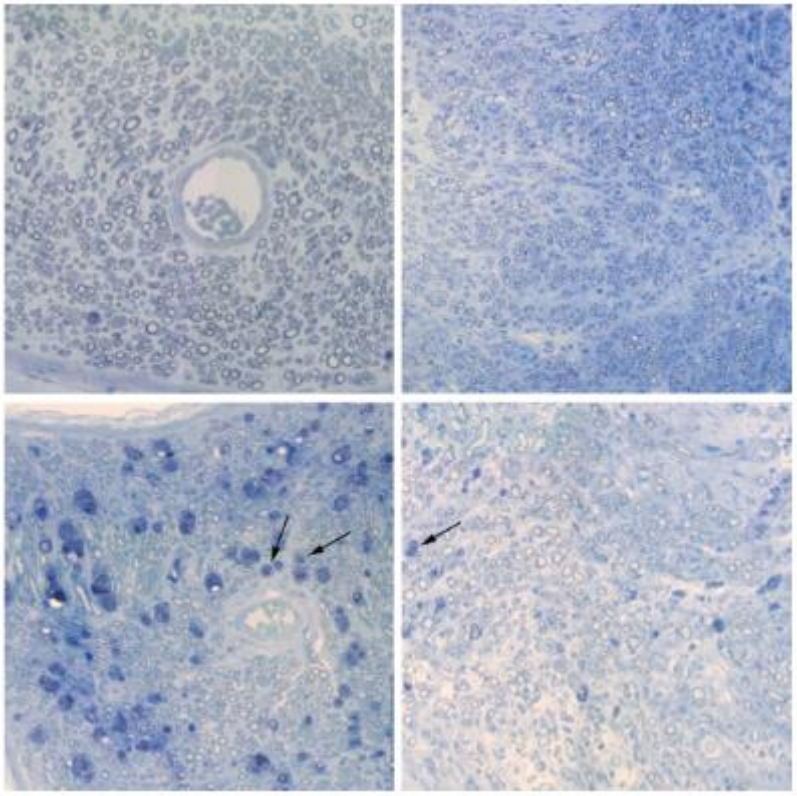
DENEYSEL ÇALIŞMALAR

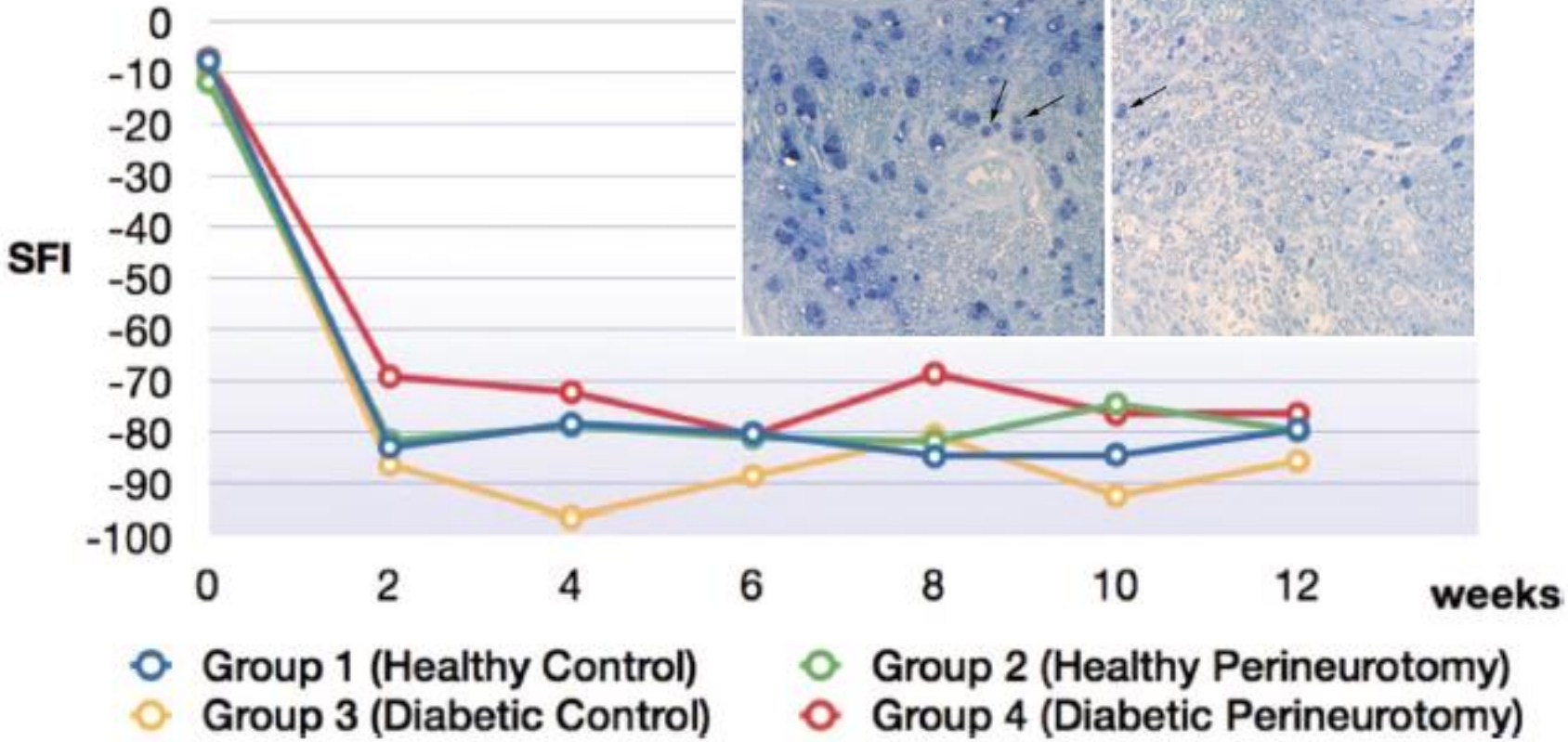


Plast Reconstr Surg 130:651e, **2012.**

DENEYSEL ÇALIŞMALAR

Plast Reconstr Surg 130:651e, **2012.**





DENEYSEL ÇALIŞMALAR

The Effect of Perineurotomy on Nerve Regeneration in Diabetic Rats: How to Export It to the Clinical Setting?

Sir:

We were impressed with the quality of the experimental work by Sahin et al.[1] on nerve regeneration. Diabetic neuropathy is an area with much potential for investigation. Even in nondiabetic compression syndromes, the double-crush model is constantly experienced. For example, when a median

Filippo Boriani, M.D., M.Sc.

Nicola Baldini, M.D., Ph.D.

Second Orthopaedic Clinic and Laboratory of Orthopedic Pathophysiology and Regenerative Medicine
Rizzoli Institute and University of Bologna
Bologna, Italy

Reply: The Effect of Perineurotomy on Nerve Regeneration in Diabetic Rats: How to Export It to the Clinical Setting?

Sir:

First, we would like to thank Boriani and Baldini for their questions. It has been suggested that, in carpal tunnel syndrome patients with a prominent narrowing of the median nerve, longitudinal epineurotomy would result in greater pressure relief, better nerve volume recovery, and better outcomes than a standard carpal ligament dissection.[1] However, when we looked at the

Cihan Sahin, M.D.

Department of Plastic and Reconstructive Surgery
Kasimpasa Military Hospital
Istanbul, Turkey

Yalcin Kulahci, M.D.

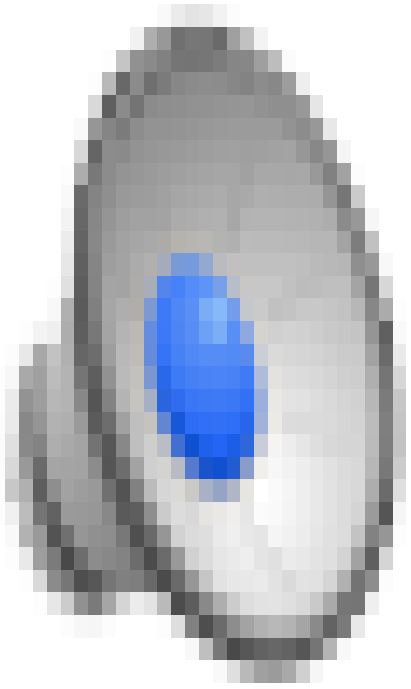
Huseyin Karagoz, M.D., Ph.D.

Fuat Yuksel, M.D.

Department of Plastic and Reconstructive Surgery
Gulhane Military Medical Academy
Haydarpasa Training Hospital
Istanbul, Turkey

Plast Reconstr Surg 131:929e-930e, **2013.**

DENEYSEL ÇALIŞMALAR



SONUÇ

Dr Dellon’ un izniyle

SONUÇ

“Diyabetik Nöropati’nin kötü prognozu değiştirilebilir”