Painless Management of the Oral Surgical Patient: Are We There Yet?

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Love conquers all things except poverty and toothache.

Mae West

- An update on pain
- An update on classification of pain
- Perioperative techniques to minimise pain
- Managing and preventing post operative pain
- Surgical methods
- Whats new?

IASP definition of pain

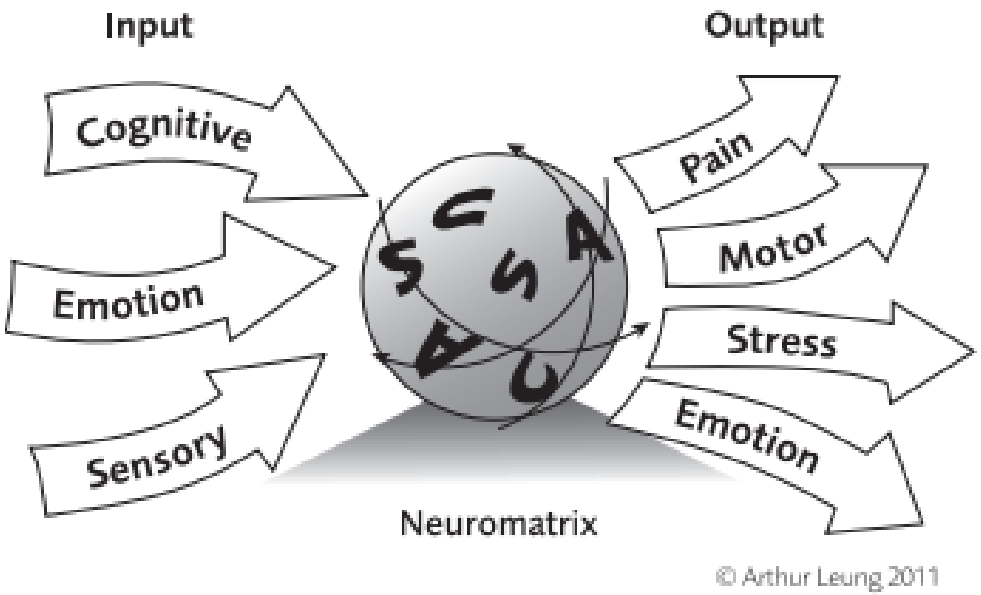
An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

‘pain is inevitable, suffering is optional’

(Haruki Murakami)

Pain is complex

Figure 2. The concept of the neuromatrix theory for pain



Itself visualised as an entity (like an incessant spinning sphere) comprising the somatosensory (S), cognitive (C) and affective (A) domains, it receives inputs from areas of the brain governing sensation, emotions and cognitions and, in return, churns out a neurosignature (output) which activates various programmes for pain recognition, motor response, emotional and stress reactions. (Adapted from Melzack, Evolution of the neuromatrix theory of pain. The Prithvi Raj Lecture: presented at the third World Congress of World Institute of Pain, Barcelona 2004. Pain Pract. 2005 Jun;5(2):85–94.)

Chronic pain: Consequences UK

TNI

- 33% of UK population suffer
- 13% work force is compromised
- Diabetic and HIV neuropathy
- Accounts for £80 billion year UK

TNI

The report, "**Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research,**" says the nation's health care system has largely failed Americans in pain and calls for a "cultural transformation" of the way in which the United States approaches and manages patients with pain.

"**A third of the nation experiences chronic pain**. ... Costing us more than we pay as a nation on cardiovascular disease and cancer,"

Chronic pain costs the US up to $635 billion each year in medical treatment and lost productivity. *The 2010 Patient Protection and Affordable Care Act* required the Department of Health and Human Services (HHS) to enlist the IOM in examining pain as a public health problem.

(Institute of medicine USA 2011 report on pain)

What is pain?

TNI

- Subjective sensation
  - with physical and psychological effects
- Individual response
  - dependant on
  - age / gender / experience / personality / anxiety
  - settings / trust in clinician / fatigue
- Organic and or psychological cause
- Invisible to others
- Can it be socially endemic?

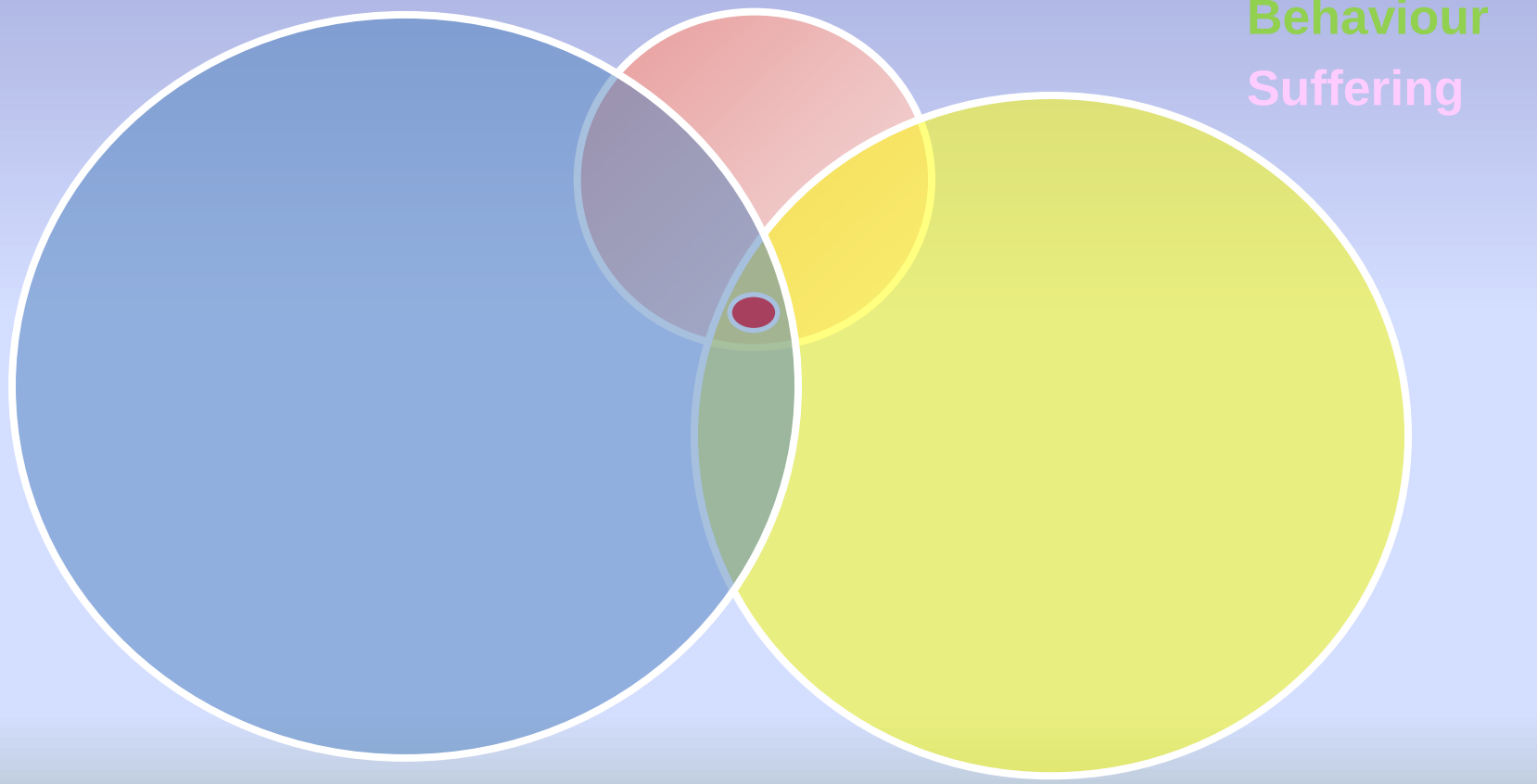
Definition of pain

"An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage"

(**IASP, 1979**)

Pain process

TNI



Rugby player

TNI

Nociception

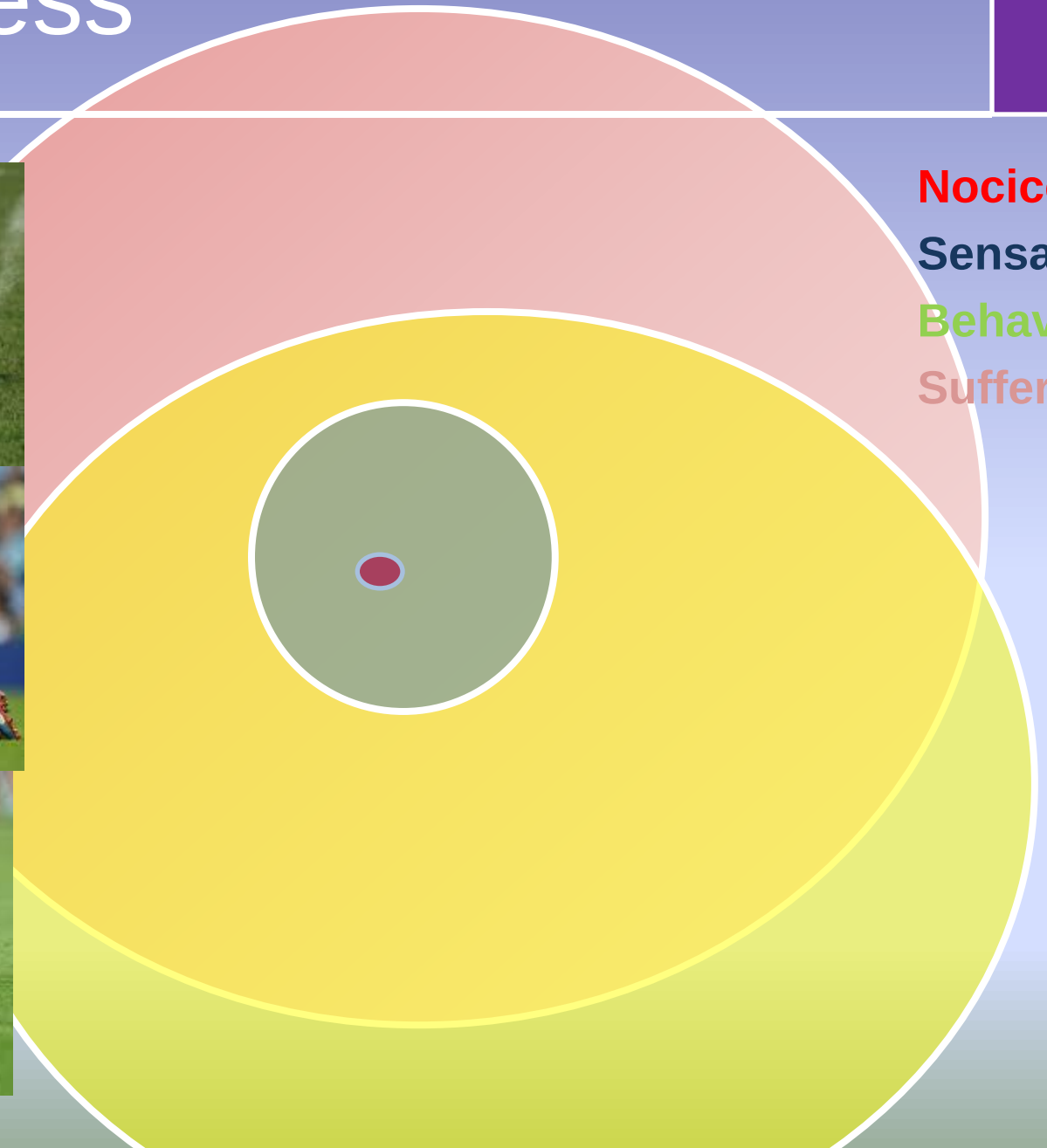
Sensation

Behaviour

Suffering

Pain Process

TNI



Nociception

Sensation

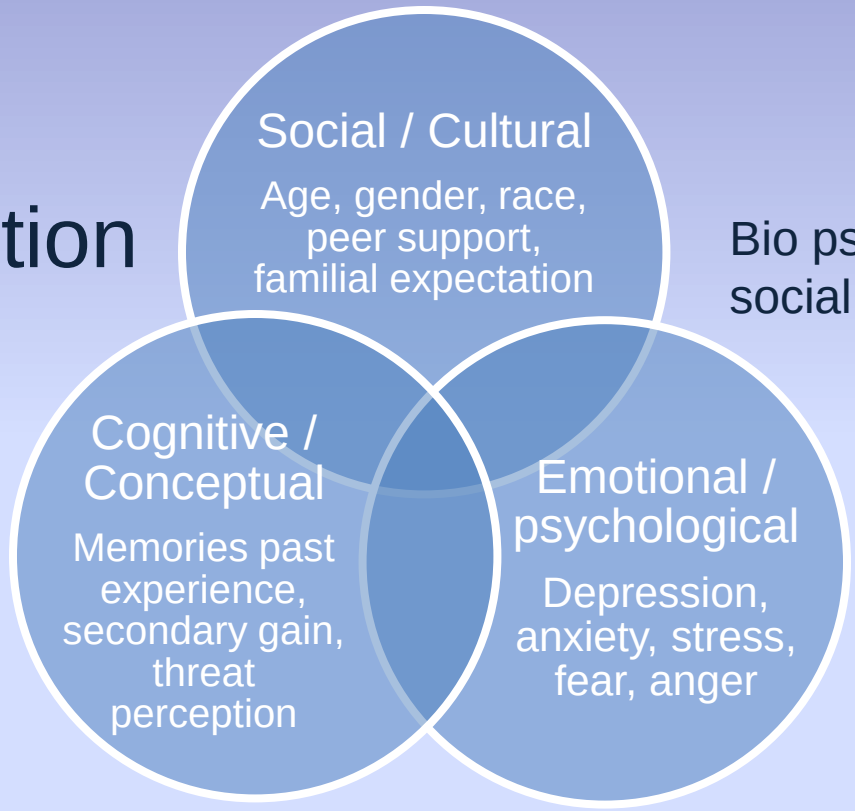
Behaviour

Suffering

Pain Process

TNI

- Nociception
- Sensation/perception
- Behaviour
- Suffering

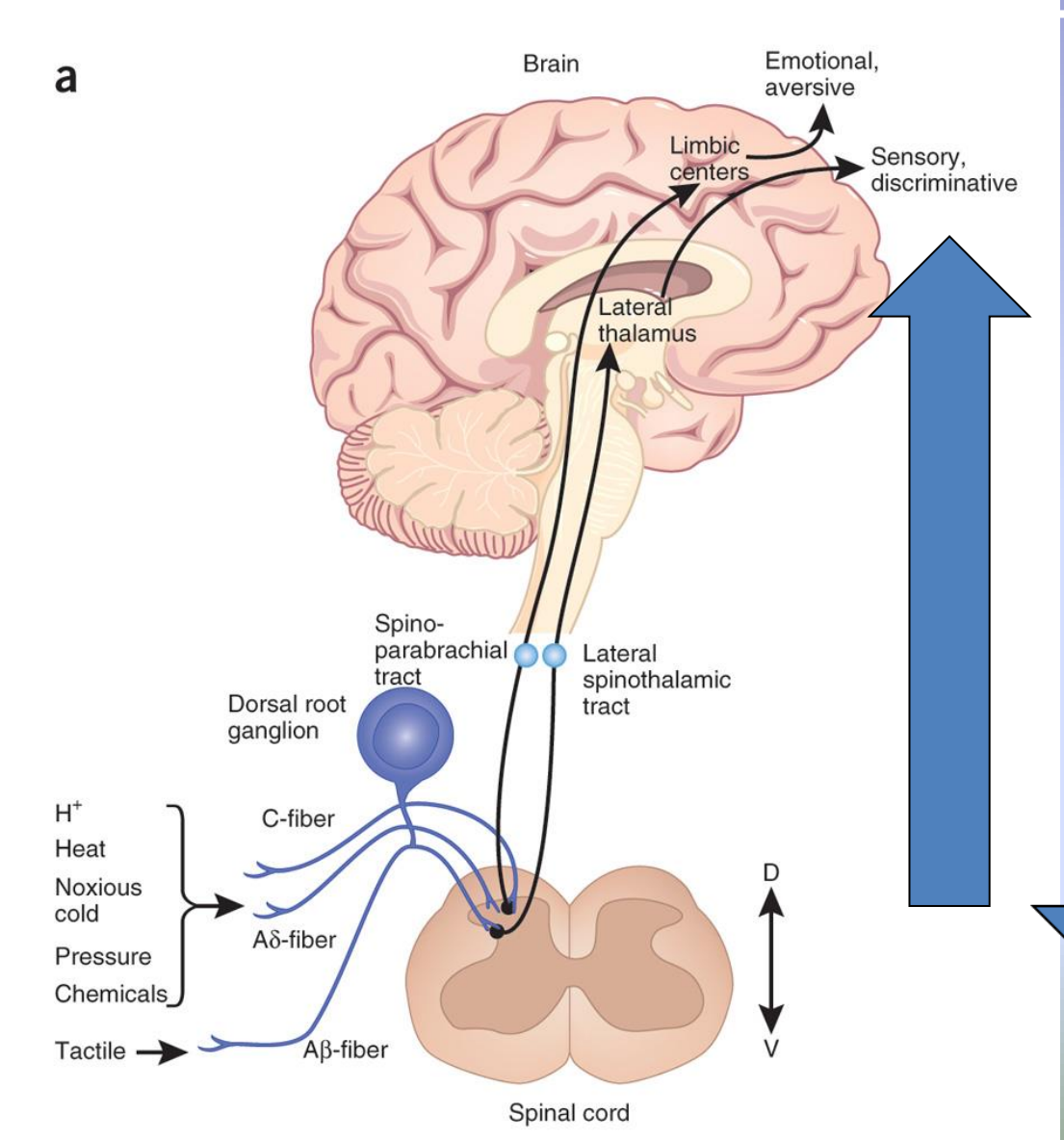


Bio psycho social Model

Do genetics influence all of these factors?

Nociception

TNI



CNS and PNS

Receptor

Primary sensory nerve

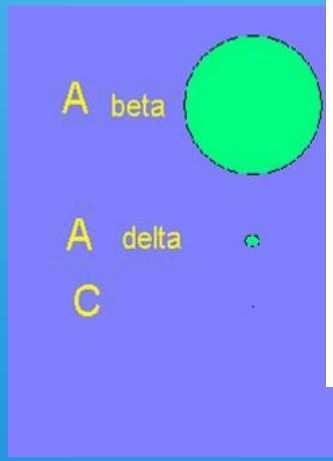
- A Delta and C fibres

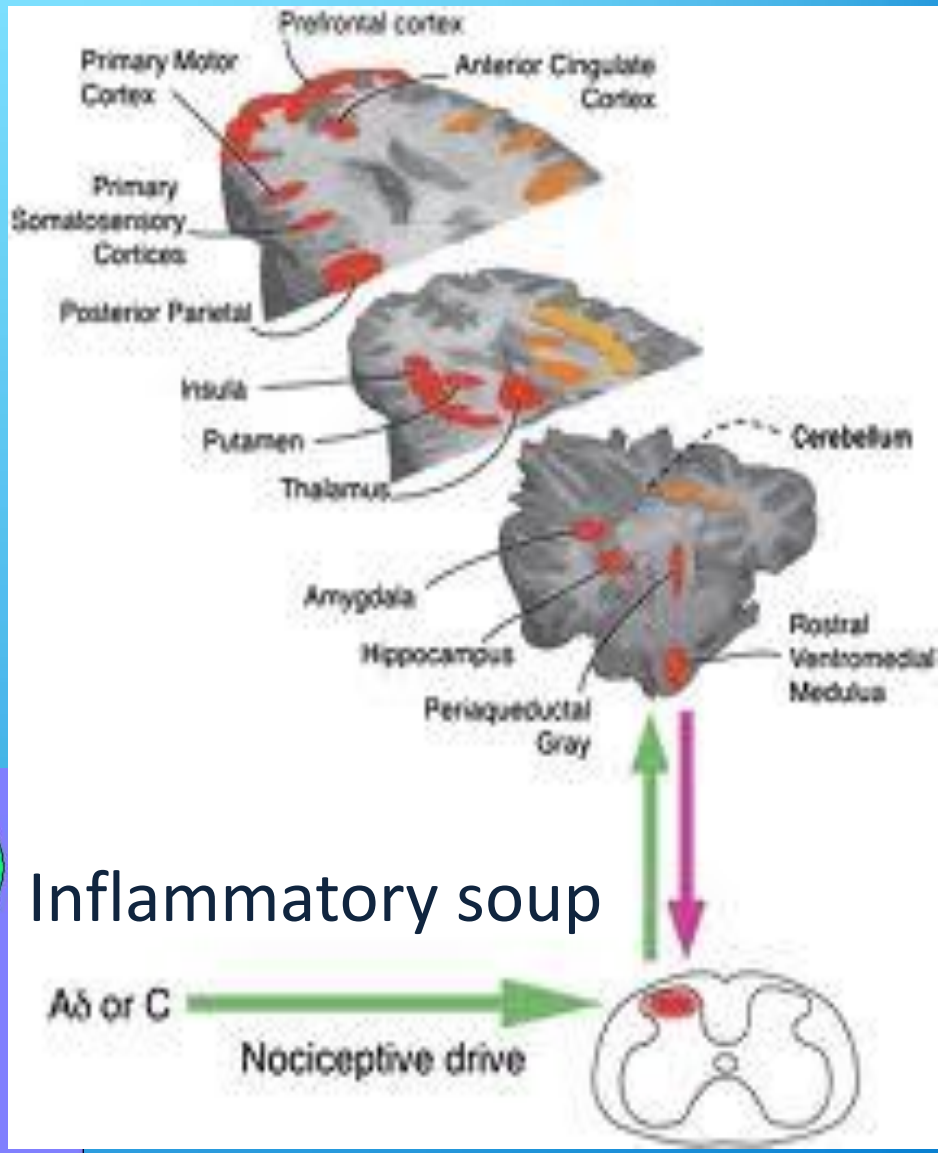
Secondary sensory nerve

- Lamina I DRG

Tertiary sensory nerve

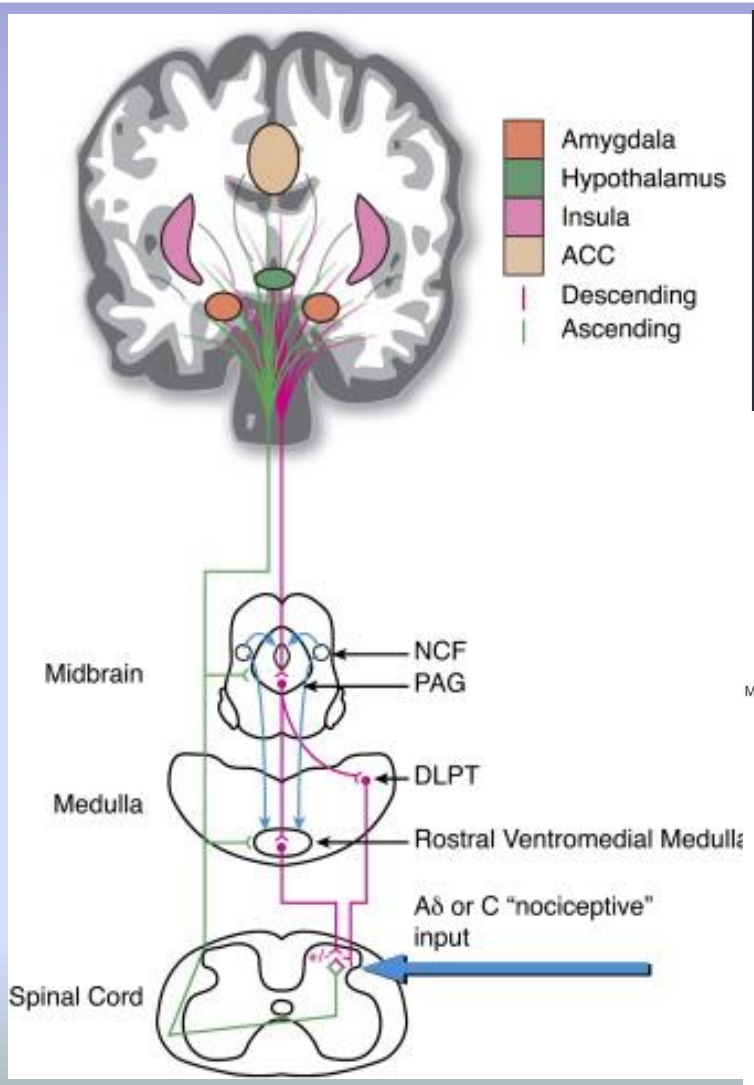
- Specific areas of the brain
  - Thalamus
  - Anterior cingulate cortex
  - S1 / S2
  - Insula
  - Brainstem

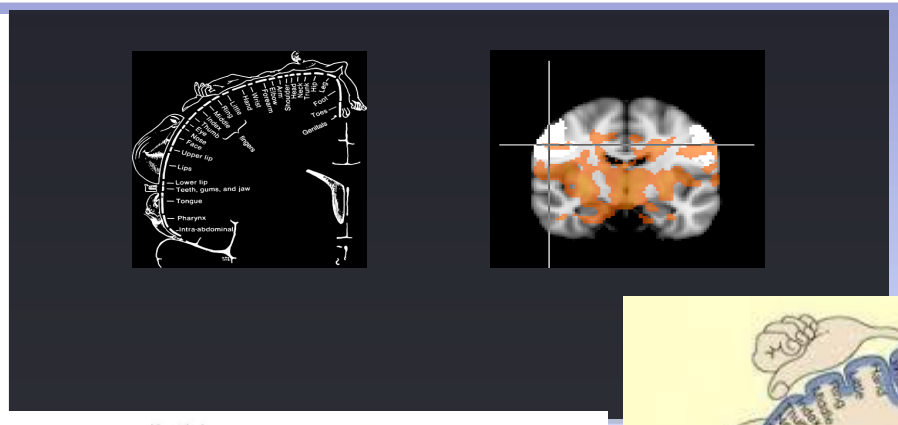


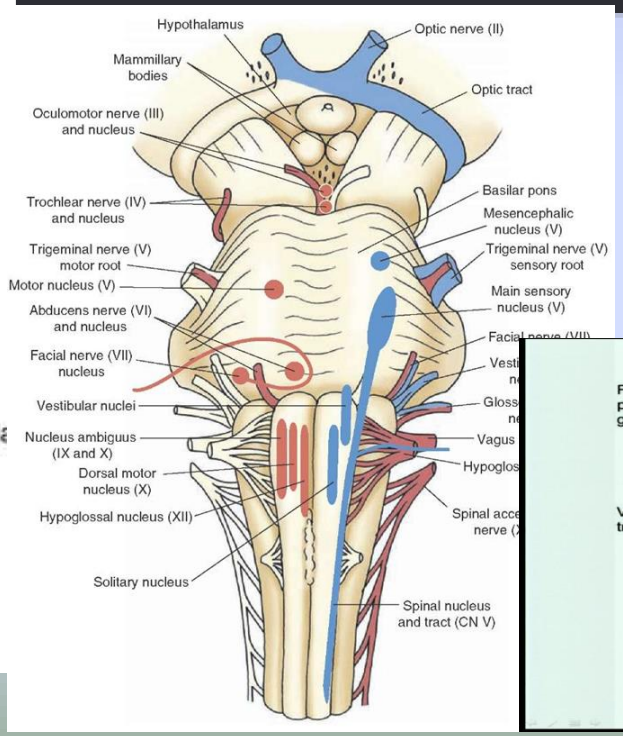


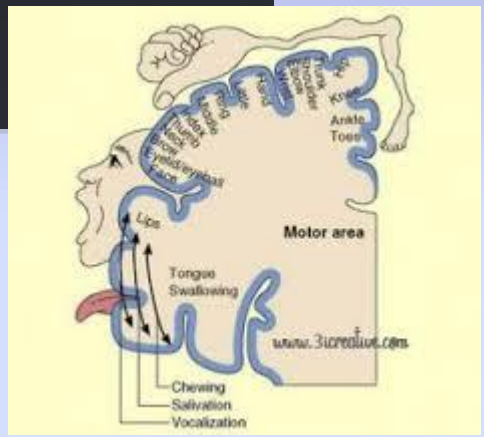
Sensation

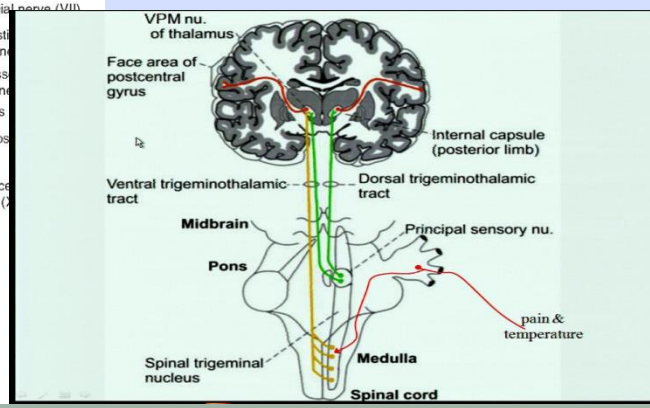
TNI









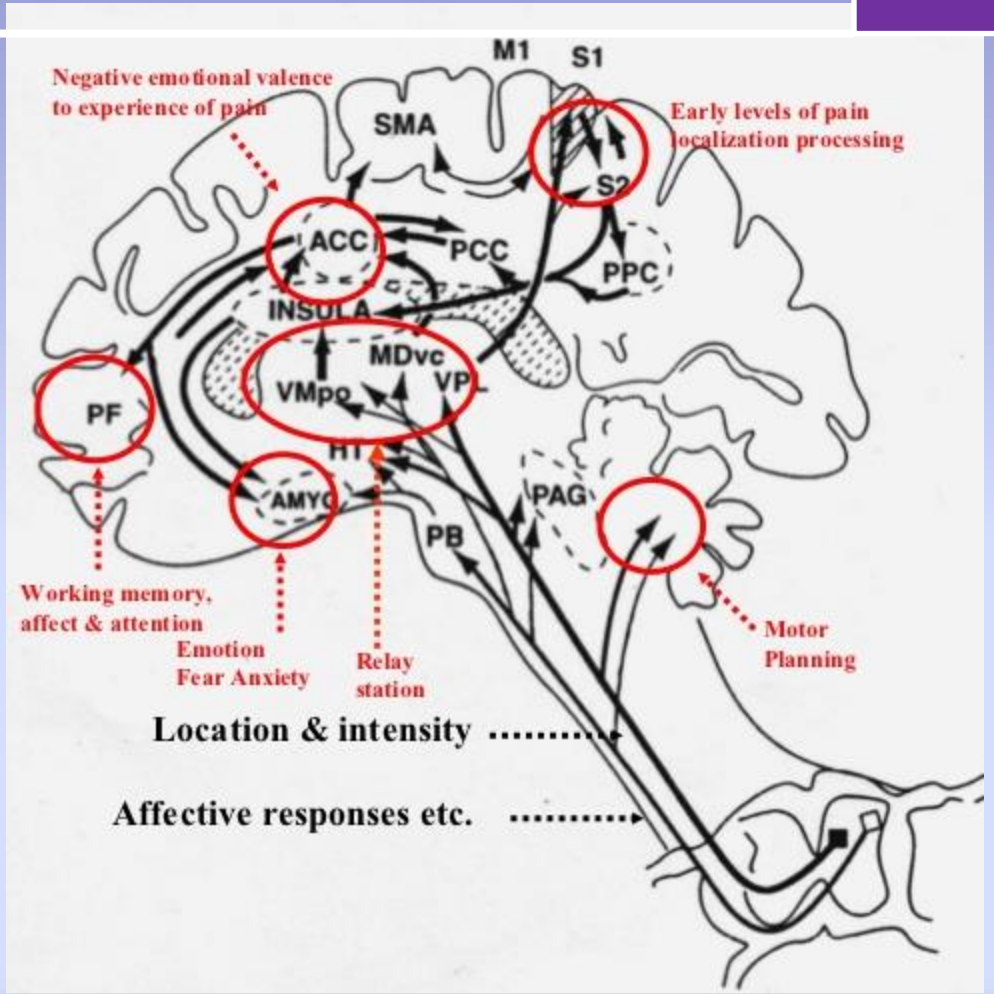


Sensation -Pain Matrix

TNI

The ‘Pain Matrix’ brain areas reactive to pain

26 areas of the brain affected so far!



Behaviour

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- Phenotype
- Genotype
- Epigenetics

Affective emotional areas of Brain

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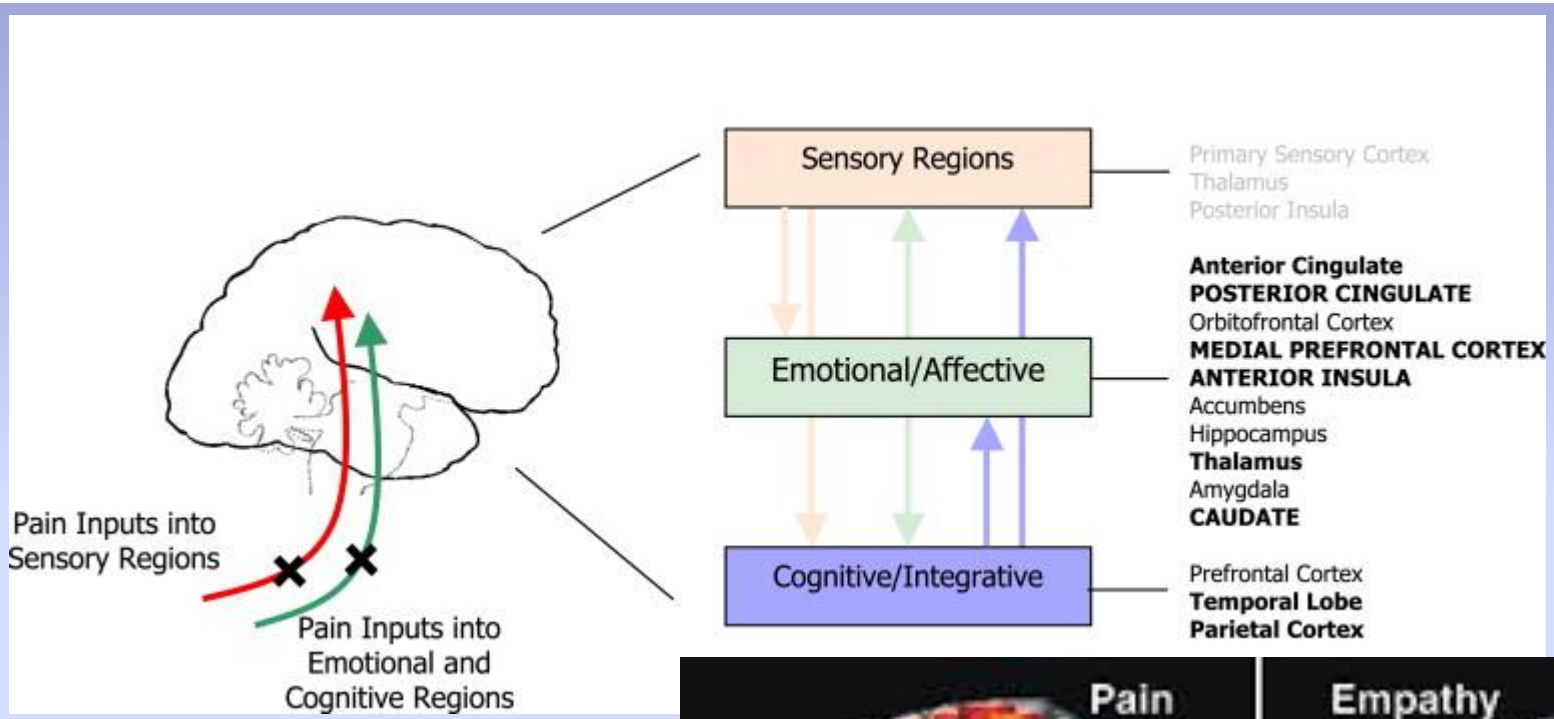
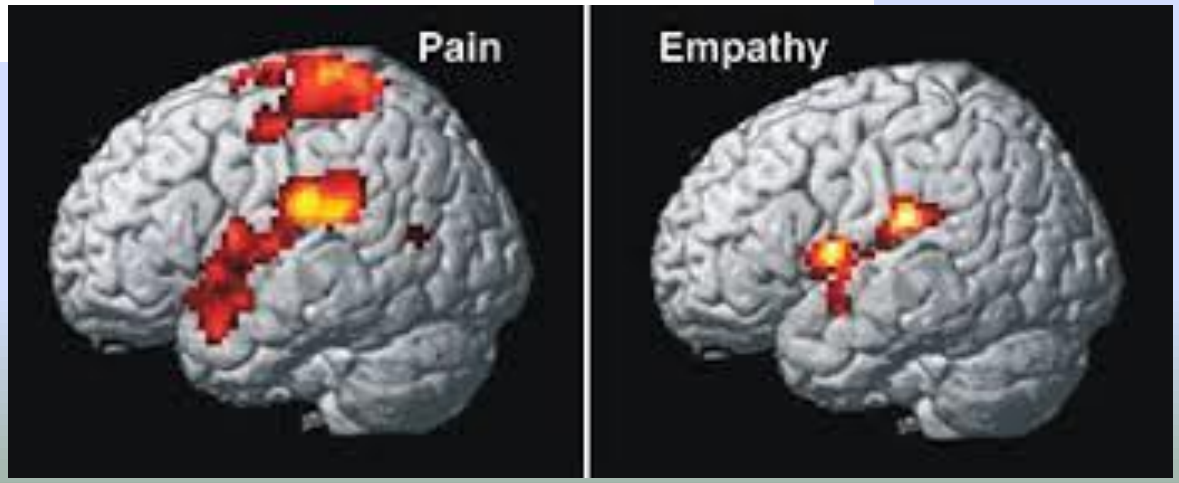




Perception of pain

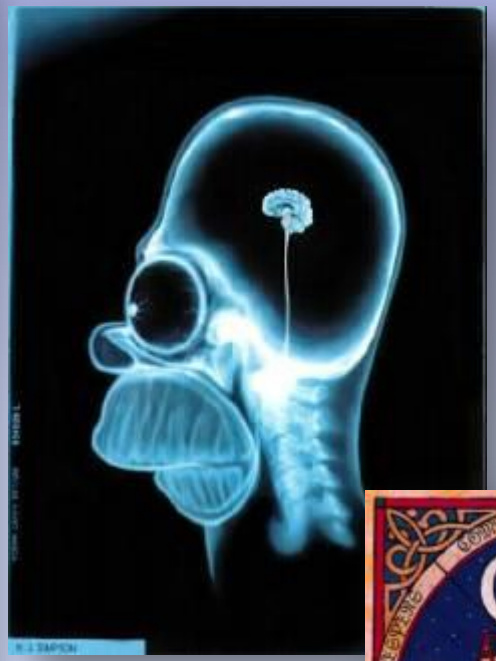
TNI

Perception of pain

TNI

‘I enjoy the pain’

David Beckham on tattoos



Opus Dei Priest ‘Pain is good’

Suffering

TNI

History
Stress
Anxiety
Culture
Ethnicity
Beliefs
Age
Environment
Context

Personality
Religion
Placebo
Anger
Catastrophising
Fear

Catastrophising

TNI

Sullivan M et al. Perceived Injustice is Associated with Heightened Pain Behavior and Disability in Individuals with Whiplash Injuries. Psychol. Inj. and Law DOI 10.1007/s12207-009-9055-2

Genetics of pain

TNI

- Melanocortin 1 receptor def –Mu opoid receptor def
- Need 20% 20% more anaesthetic
- Melanocortin-1 Gene for Red Hair

2002 “It does appear that redheads have a significantly different pain threshold and require more anaesthetic to block out certain pains,”

2009 that redheads were more anxious about dental treatment and more than twice as likely to avoid a vis

2010 Danish study suggests red headed people feel more but could handle eating hot food

- An update on pain
- **An update on classification of pain**
- Perioperative techniques to minimise pain
- Managing and preventing post operative pain
- Surgical methods
- Whats new?

Types of pain .....

TNI

Review series introduction

What is this thing called pain?

Clifford J. Woolf

Program in Neurobiology and Department of Neurology, Children's Hospital Boston, and Department of Neurobiology, Harvard Medical School, Boston, Massachusetts, USA.

To paraphrase Cole Porter's famous 1926 song, "What is this thing called pain? This funny thing called pain, just who can solve its mystery?" Pain, like love, is all consuming: when you have it, not much else matters, and there is nothing you can do about it. Unlike love, however, we are actually beginning to tease apart the mystery of pain. The substantial progress made over the last decade in revealing the genes, molecules, cells, and circuits that determine the sensation of pain offers new opportunities to manage it, as revealed in this Review series by some of the foremost experts in the field.

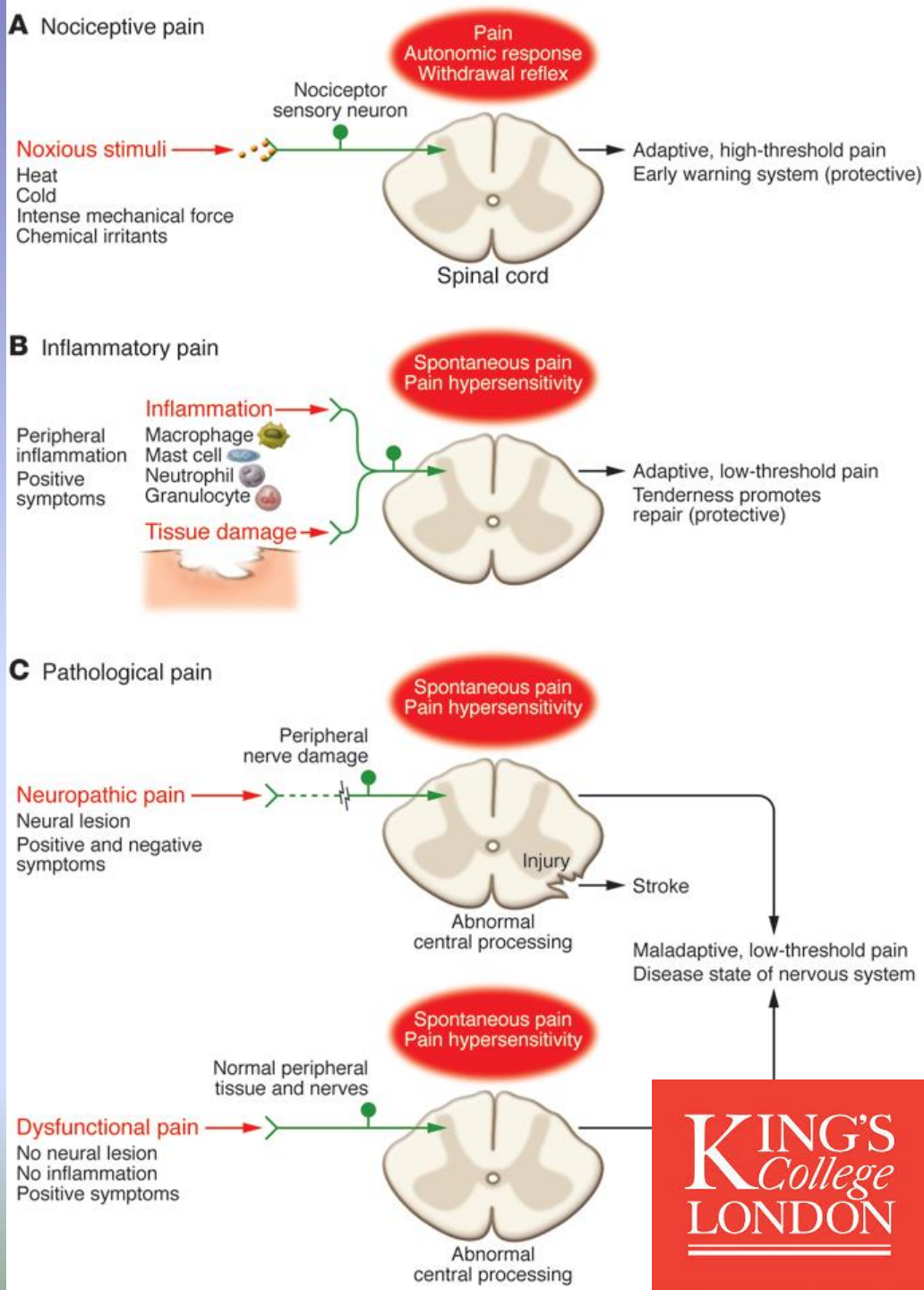
Classifying pain

What exactly, from a neurobiological perspective, is pain? Pain is actually three quite different things, although we and many of our physicians commonly fail to make the distinction. First, there is the pain that is an early-warning physiological protective system, essential to detect and minimize contact with damaging or noxious stimuli. This is the pain we feel when touching something too hot, cold, or sharp. Because this pain is concerned with the sensing of noxious stimuli, it is called *nociceptive* pain (Figure 1A), a high-threshold pain only activated in the presence of intense stimuli (1). The neurobiological apparatus that generates nociceptive pain evolved from the capacity of even the most primitive of nervous systems to signal impending or actual tissue damage from envi-

and other syndromes in which there exists substantial pain but no noxious stimulus and no, or minimal, peripheral inflammatory pathology. The clinical pain syndrome with the greatest unmet need, pathological pain is largely the consequence of amplified sensory signals in the central nervous system and is a low-threshold pain. By analogy, if pain were a fire alarm, the nociceptive type would be activated appropriately only by the presence of intense heat, inflammatory pain would be activated by warm temperatures, and pathological pain would be a false alarm caused by malfunction of the system itself. The net effect in all three cases is the sensation we call pain. However, because the processes that drive each are quite different, treatments must be targeted at the distinct mechanisms responsible.

4 types of pain

- Nociceptive healthy feeling pain 'pain'
- Inflammatory pain health short lived after insult
- Neuropathic pains
- Dysfunctional pain



Clifford J. Woolf. **What is this thing called pain?** J Clin Invest. Nov 1, 2010; 120(11): 3742–3744.

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Healthy nociceptive pain

Dentine sensitivity

Healthy inflammatory pain/infection/t Trauma

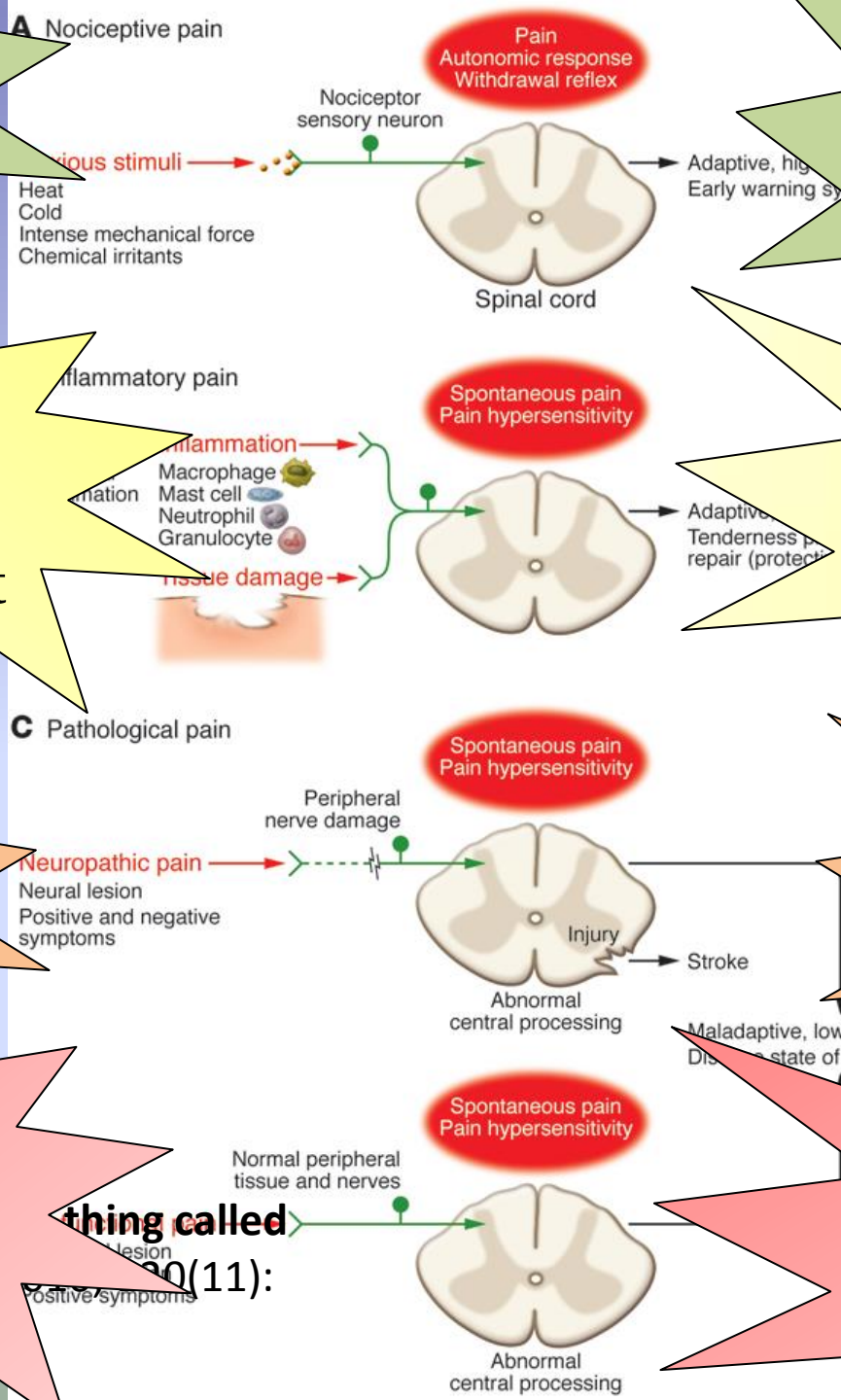
Pulpitis reversible +irreversible Periapical periodontitis

Chronic neuropathi c pain

Posttraumatic neuropathy PDAP/ PHN

Dysfunctional pain

Fibromyalgia PIFP TMD arthromyalg



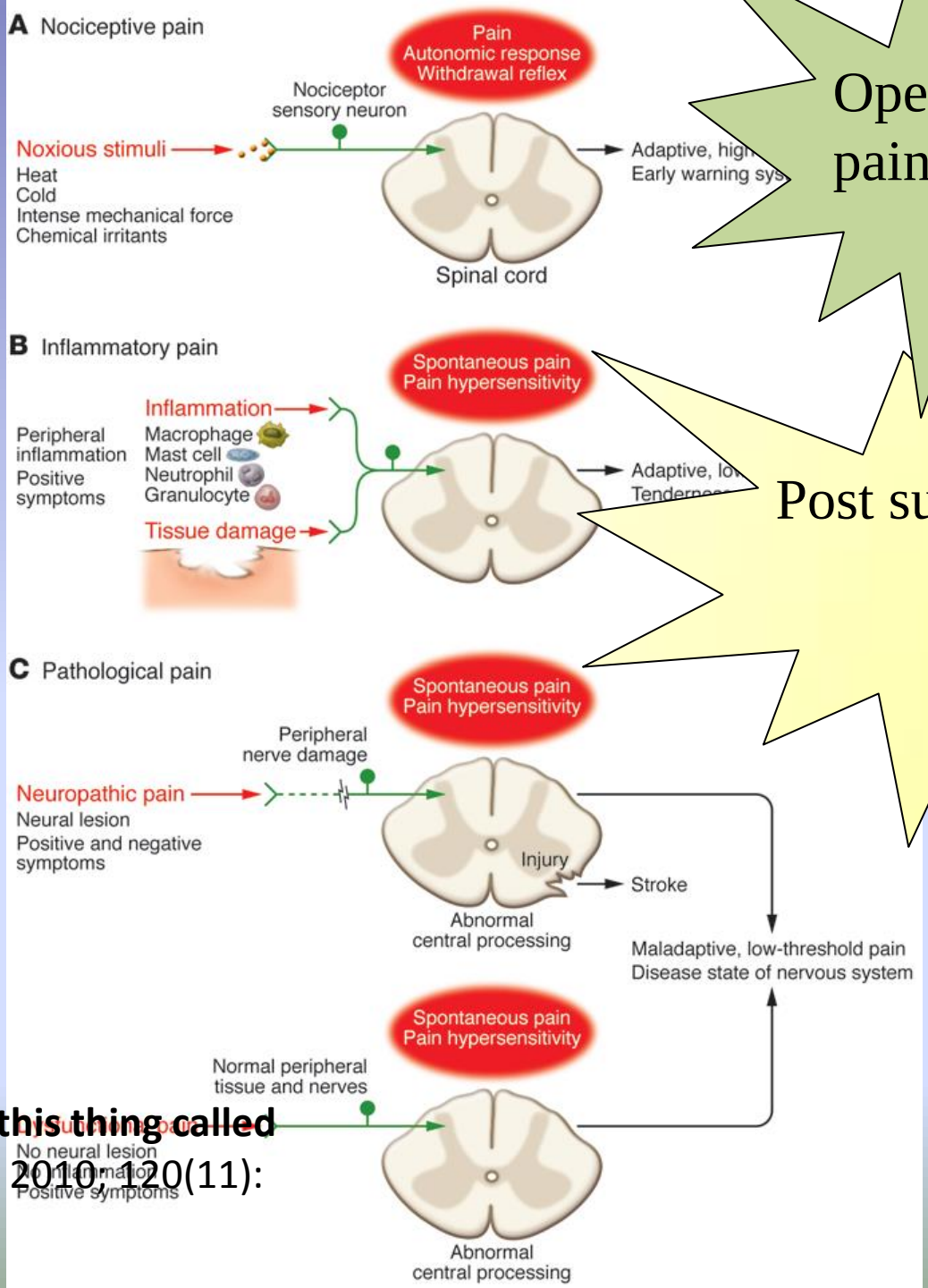
thing called

(11):

3742–

Operative pain

Post surgical pain



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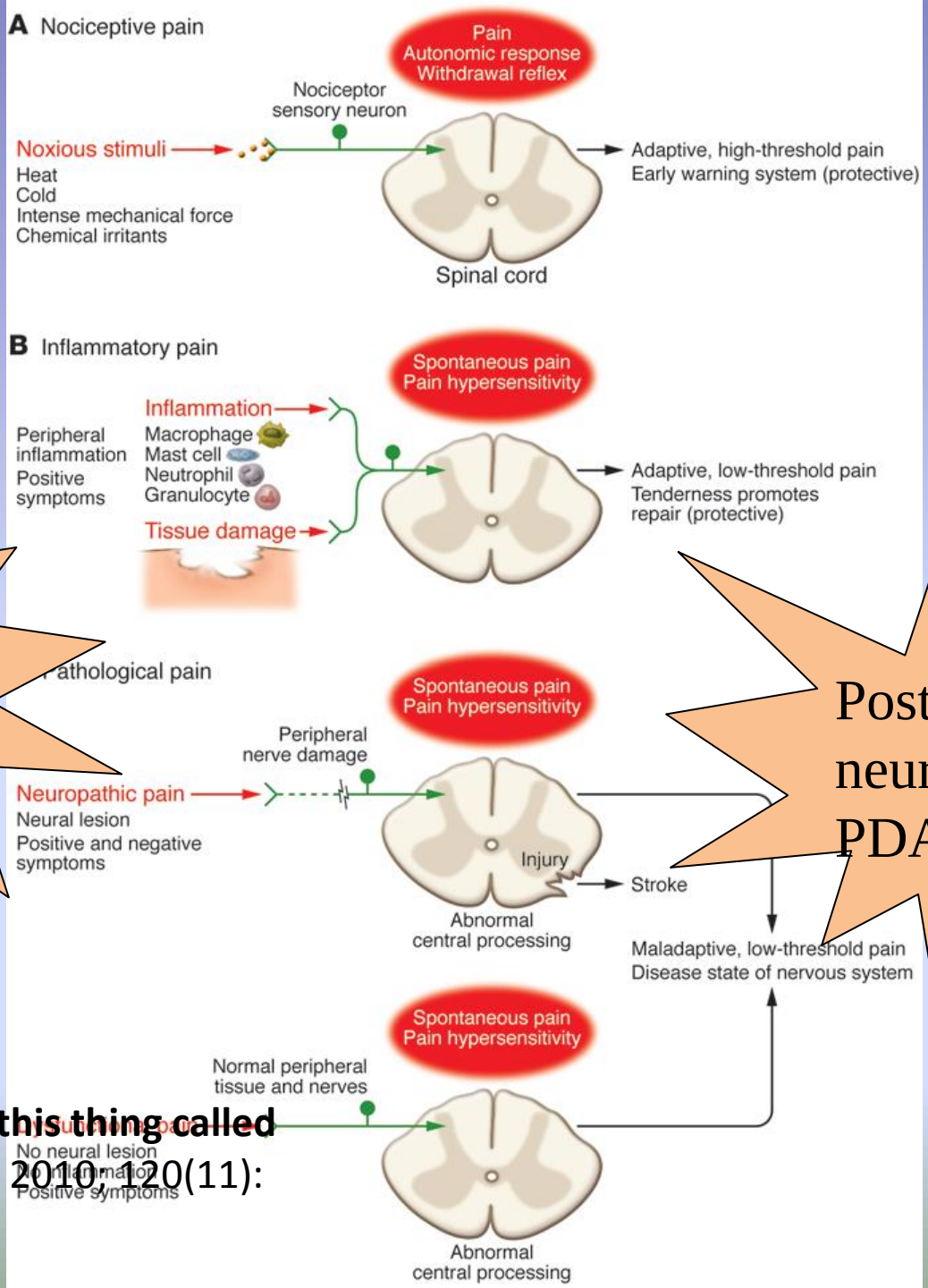

Chronic neuropathic pain

Post traumatic neuropathy PDAP/ PHN

Clifford J. Woolf. **What is this thing called pain?** J Clin Invest. Nov 1, 2010; 120(11): 3742–3744.

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PAIN® xxx (2011) xxx–xxx

PAIN®

www.elsevier.com/locate/pain

Commentary

A new definition of neuropathic pain

1. Introduction

IASP has recently published a new definition of neuropathic pain according to which neuropathic pain is defined as "pain caused by a lesion or disease of the somatosensory system" (www.iasp-pain.org/resources/painDefinition). This definition replaces the 17-year old definition that appeared in the *Classification of Chronic Pain* published by IASP in 1994 [7], which defined neuropathic pain as "pain initiated or caused by a primary lesion, dysfunction, or transitory perturbation of the peripheral or central nervous system". Even though the definition has not been changed dramatically, there are two important changes in the new version: (1) the word "dysfunction" has been removed and (2) a lesion or disease affecting the nervous system has been specified to be a lesion or disease of the somatosensory system.

2. Background

The history behind this change dates back several years with a long, and at times, heated debate about the inclusion of the term

nisms are known, but many are not. Increased understanding of pain mechanisms should put us in a better position to treat patients and design rational treatment strategies. There has indeed been progress since the last update of the neuropathic pain definition 17 years ago. For example, primary erythromelalgia and paroxysmal extreme pain disorder are both rare pain conditions for which we had no explanation 10 years ago, and therefore pain associated with these could not then have been classified as neuropathic. It is now clear that both disorders are due to specific and separable mutations in the SCN9A gene that codes for one of the many subtypes of neuronal voltage-gated sodium channels: the Na_v 1.7 channel [1]. While these observations have not yet resulted in a specific or preventive treatment for the rare genetic pain states, there is now a clear target that can be addressed. Another pain condition that has seen progress is Fabry's disease, which can now be treated with enzyme replacement therapy [6]. Biomarkers for an inflammatory component in neuropathic pain are also being discovered, and again, these may lead to new specific treatments. Other examples will certainly be added as our knowledge of diseases

Acute healthy pain → Chronic pain
= Neuromatrix disease

- Peripheral drivers
  - Neurotorphins
  - Altered receptor threshold
- Central drivers
  - Glial cells, Neurotophins
  - Reduced downward modulation, changes in brain structure
- Affective / behavioural drivers
- Genetics
- Social?

?

Trigeminal nerve

TNI

- **The great protector…..**

Sensory feedback for all cranial functions

Brains- Consciousness + neural regulation

Breathing

Sight

Smell

Taste

The face…the organ that underpins communication

The trigeminal nerve

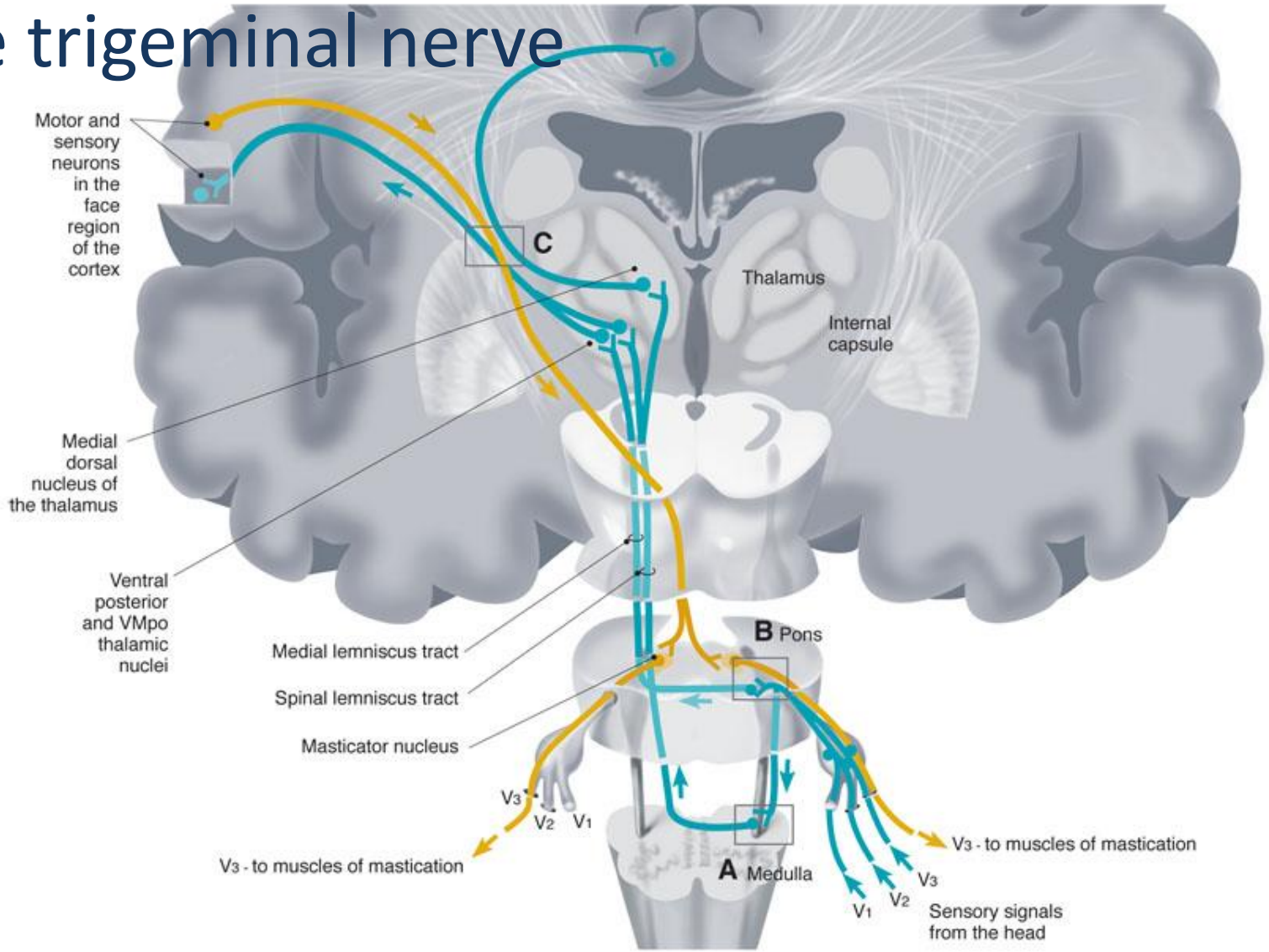
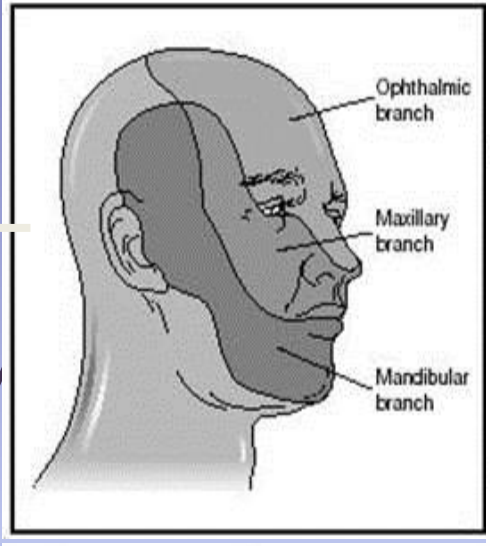
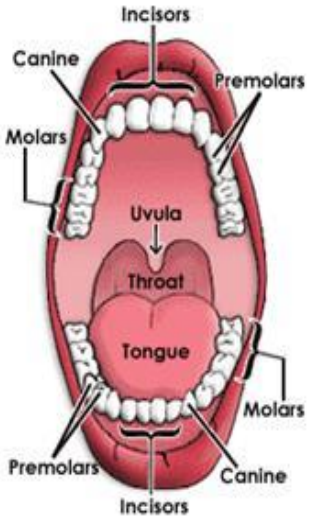


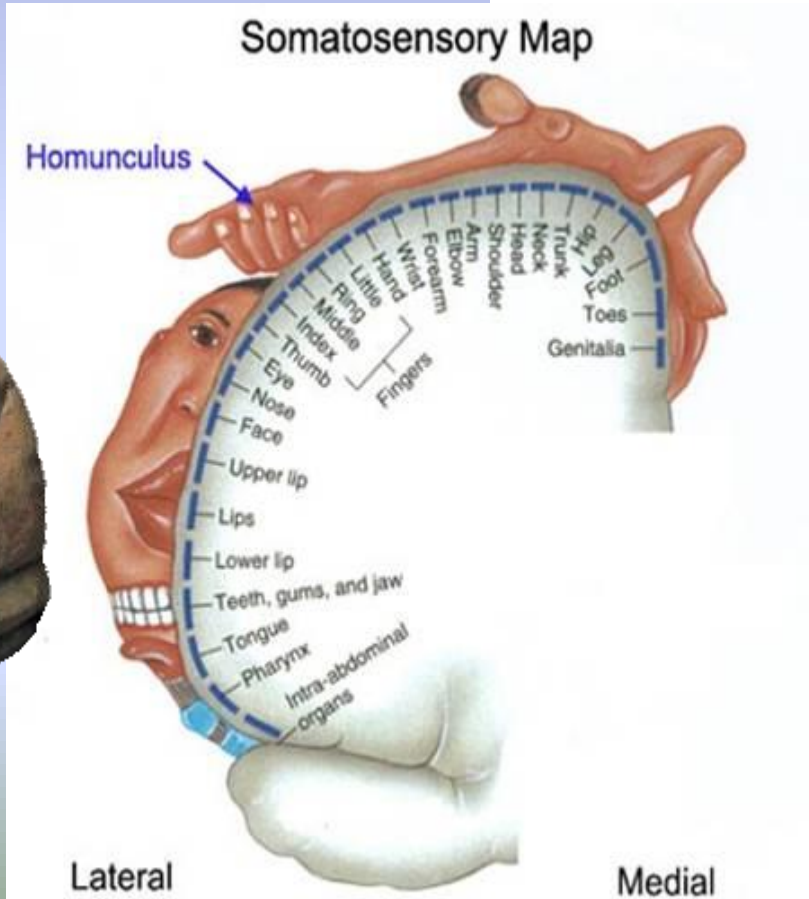
Figure V–18 Damage to the trigeminal pathways. **A**, Within the medulla; **B**, within the pons; and **C**, above the brain stem (contralateral tract). See the text for a description of the functional loss that would result from lesions A, B and C.

Trigeminal nerve

Largest sensory nerve in the body







Trigeminal nerve

TNI

Complex region

Consequences

- Social function
- Eating
- Drinking
- Speaking
- Kissing
- Make up / shaving
- Sleeping

IDENTITY?

- An update on pain
- An update on classification of pain
- **Perioperative techniques to minimise pain**
- Managing and preventing post operative pain
- Surgical methods
- Whats new?

Get the diagnosis right!

TNI

Identify cause

When possible **remove cause**:

- Extraction
- Extirpation, and
- Additional drainage pus
- Analgesics
- Rehabilitate patient

Reassess: Is the infection resolved?

If not, what additional treatment is required?

Recheck diagnosis, identify cause and remove.

Is some pus remaining and undrained?

Is incise and drainage required (I&D)?

Are antibiotics (AB) indicated?

If the infection persists with AB therapy……

Is a culture and sensitivity test required to evaluate most effective AB therapy?

Recommendations for prescribing antibioti in dentistry

TNI

There are few guidelines for prescribing antibiotics in dentistry……

- Scottish Dental Clinical Effectiveness Programme (2011) *Drug Prescribing For Dentistry: Dental Clinical Guidance.* 2nd Ed http://www.sdcep.org.uk/index.aspx?o=3130

- FGDP Guidance Antimicrobial prescription in dentistry 2006 http://www.fgdp.org.uk/content/publications/antimicrobial-prescribing-for-general-dental-pract.ashx

- BSAC recommendations for antimicrobial prescription for dental procedures

It is known that dentists over prescribe antibiotics rather than extract or extirpate the dental cause.

Over the last decade GMP prescription of antibiotics has significantly reduced whereas GDPs prescribe antibiotics even more!

- http://www.rcseng.ac.uk/fds/Documents/FDJ_Vol.1_Issue%201.pdf

SDCEP prescribing in dentistry

TNI

Scottish Dental Clinical Effectiveness Programme

Scottish Dental - SDPBRN

NHS SCOTLAND

SDCEP Home | About SDCEP | Guidance | News and Events | Search

You are here: Guidance > Drug Prescribing

- SDCEP Guidance
- Bisphosphonates
- Conscious Sedation
- Decontamination
- Dental Caries in Children
- Drug Prescribing
- Emergency Dental Care
- Management of Acute Dental Problems
- Oral Health Assessment and Review
- Practice Support Manual
- Periodontal Management

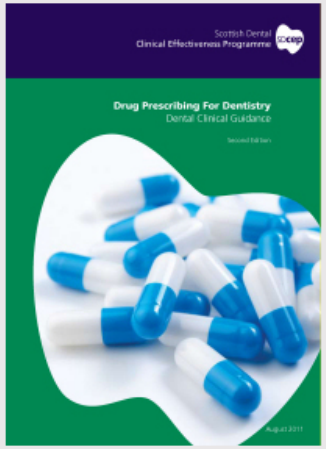
Drug Prescribing For Dentistry

(Second Edition, published August 2011)

The second edition of 'Drug Prescribing For Dentistry' can be downloaded in pdf form.

'Drug Prescribing For Dentistry' is now available as an app, Dental Prescribing, for use on iPhone®, iPad® or iPod touch®.

Dental Prescribing



Updates

November 2013

Related Information

BNF Online

Information on medicines for UK healthcare professionals

Guidance

Download SDCEP Drug Prescribing for Dentistry 2nd Edition- PDF

App

Go to the Dental Prescribing app webpage

Managing the patient's expectations

TNI

- Patient's pain expectation
- Intraoperative pain experience
- Post treatment pain
- Pain complications
  - Extreme- nerve injury?
  - Persistent- neuropathic?
  - Recurrent pain- infection?

How do we minimise the pain?

TNI

- Clinician
  - -Patient relationship
- Informed consent
  - Patient control
  - Patient expectations
- Anxiolysis
- Surgical technique
- Analgesics

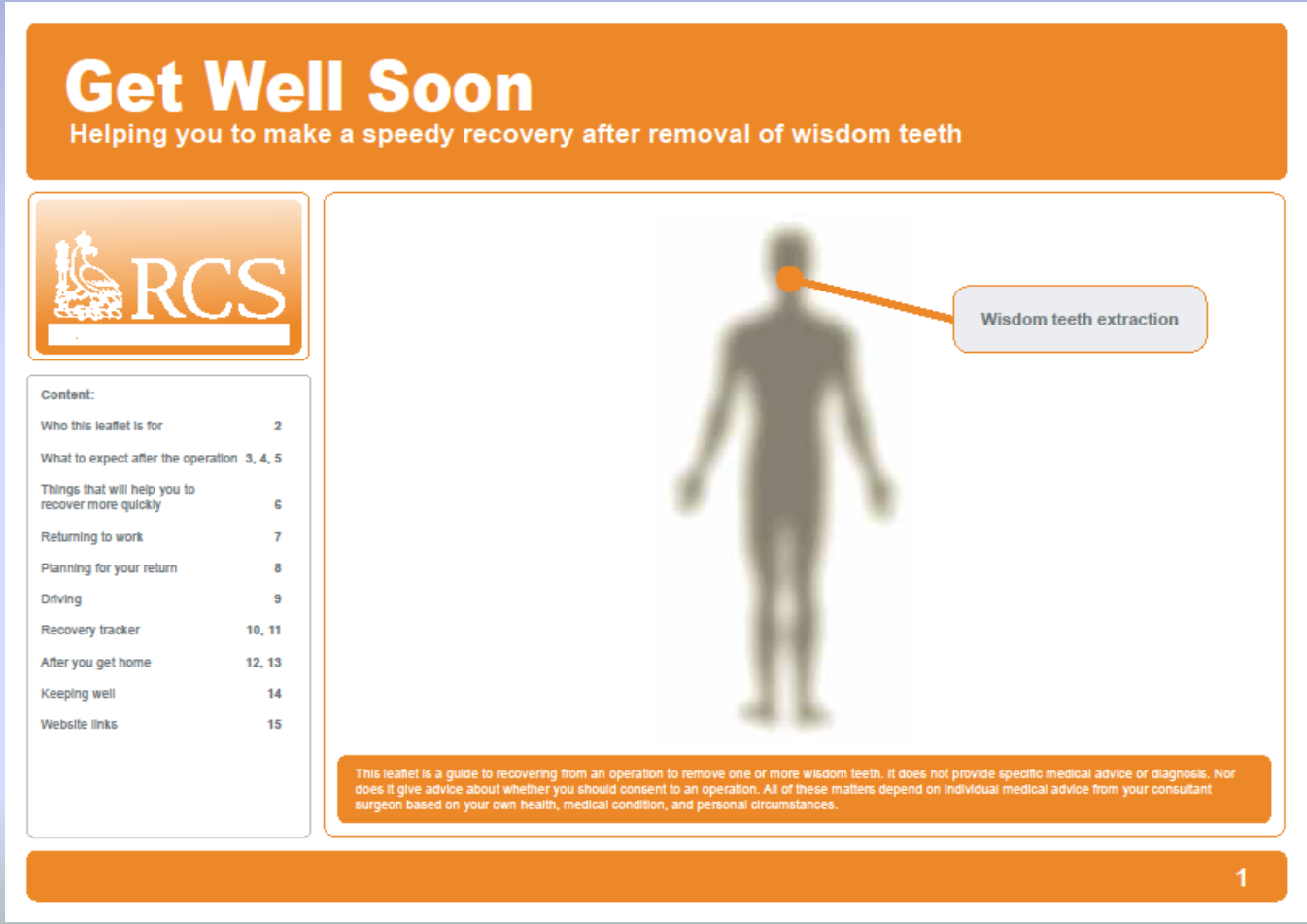
Petrie KJ et al Effect of providing **information** about normal test results on **patients**' reassurance: randomised controlled trial. BMJ. 2007 Feb 17;334(7589):352.

Arnold J et al. **Information** sheets for **patients** with acute chest **pain**: randomised controlled trial.BMJ. 2009 Feb 26;338:

Informed consent……

Get well soon leaflet

TNI



Get Well Soon

Helping you to make a speedy recovery after removal of wisdom teeth

RCS

Content:

This leaflet is a guide to recovering from an operation to remove one or more wisdom teeth. It does not provide specific medical advice or diagnosis. Nor does it give advice about whether you should consent to an operation. All of these matters depend on individual medical advice from your consultant surgeon based on your own health, medical condition, and personal circumstances.

1

Managing patients expectations of surgical related pain is effective in pain relief !

Relationship between preoperative expectations, satisfaction, and functional outcomes in patients undergoing lumbar and cervical spine surgery: a multicenter study. Soroceanu A, Ching A, Abdu W, McGuire K. Spine (Phila Pa 1976). 2012 Jan 15;37(2):E103-8

Complications best avoided

TNI

- Fore arm the patient
  - Have an honest conversation about risks

VALID CONSENT

- Do you have the correct diagnosis?
- Can you handle the medical complexity?
- Are you able to undertake the procedure?
- **DON'T overestimate your ability or talent!**
  - Would you do this on your daughter/friend???????
- Can you manage the possible complications?

- **If NO to any of the above ….**Ask for assistance get training or even better…….REFER ?

Be Honest!

TNI

The dentist

TNI

Sadimsm **mas·och·ism** (m s -k z m)
A willingness or tendency to subject others of oneself to unpleasant or trying experiences.

Anxiety, stress and pain

TNI

Psychological factors driving pain

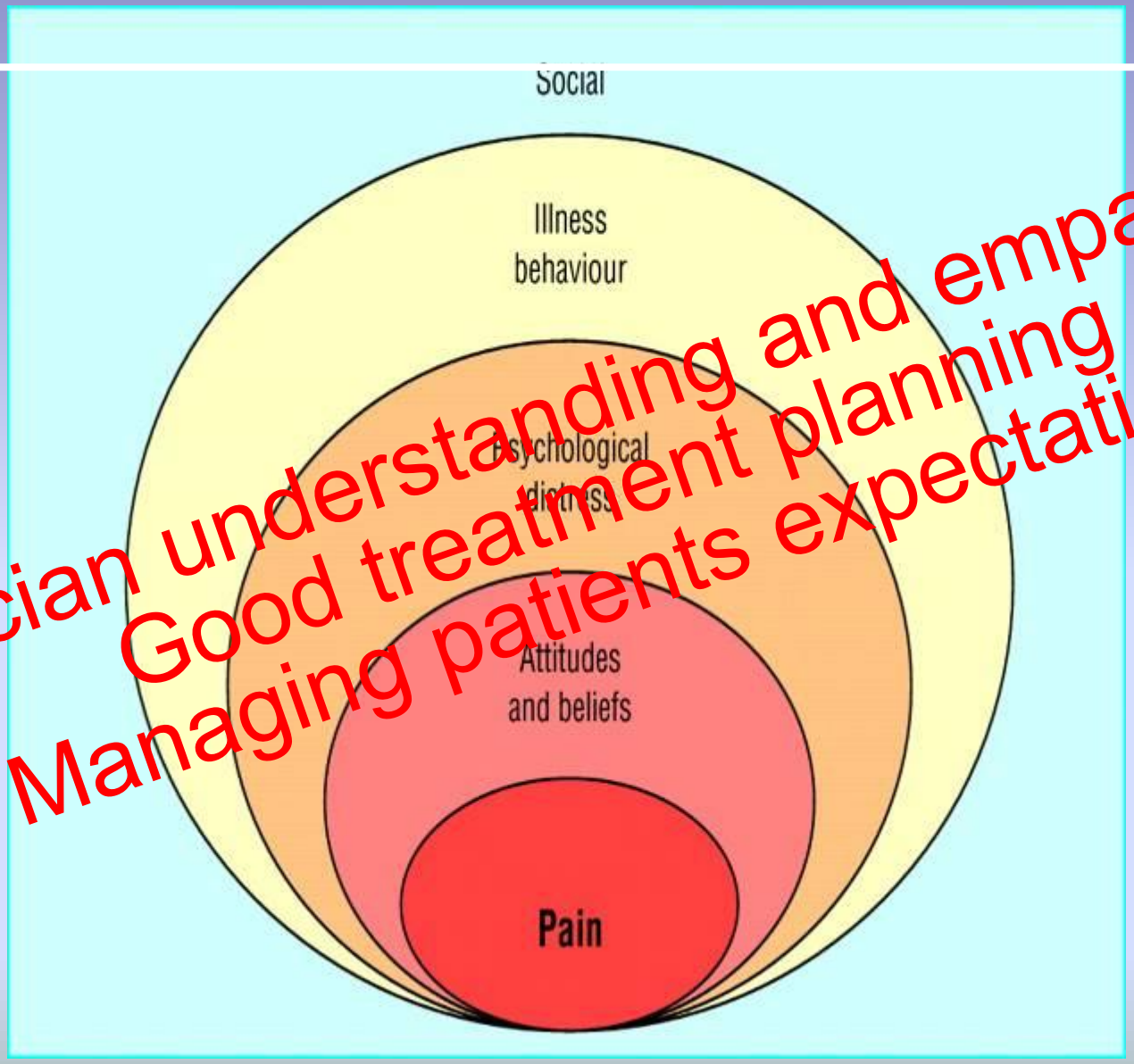
Sullivan MJ et al. Catastrophizing and perceived injustice: risk factors for the transition to chronicity after whiplash injury. Spine (Phila Pa 1976). 2011 Dec 1;36(25 Suppl):S244-9 Dec;92(12):2041-56. Review

Lajnert V, et al Depression, somatization and **anxiety** in female patients with temporomandibular disorders (TMD). Coll Antropol. 2010 Dec;34(4):1415-9

Alternative and holistic management of pain

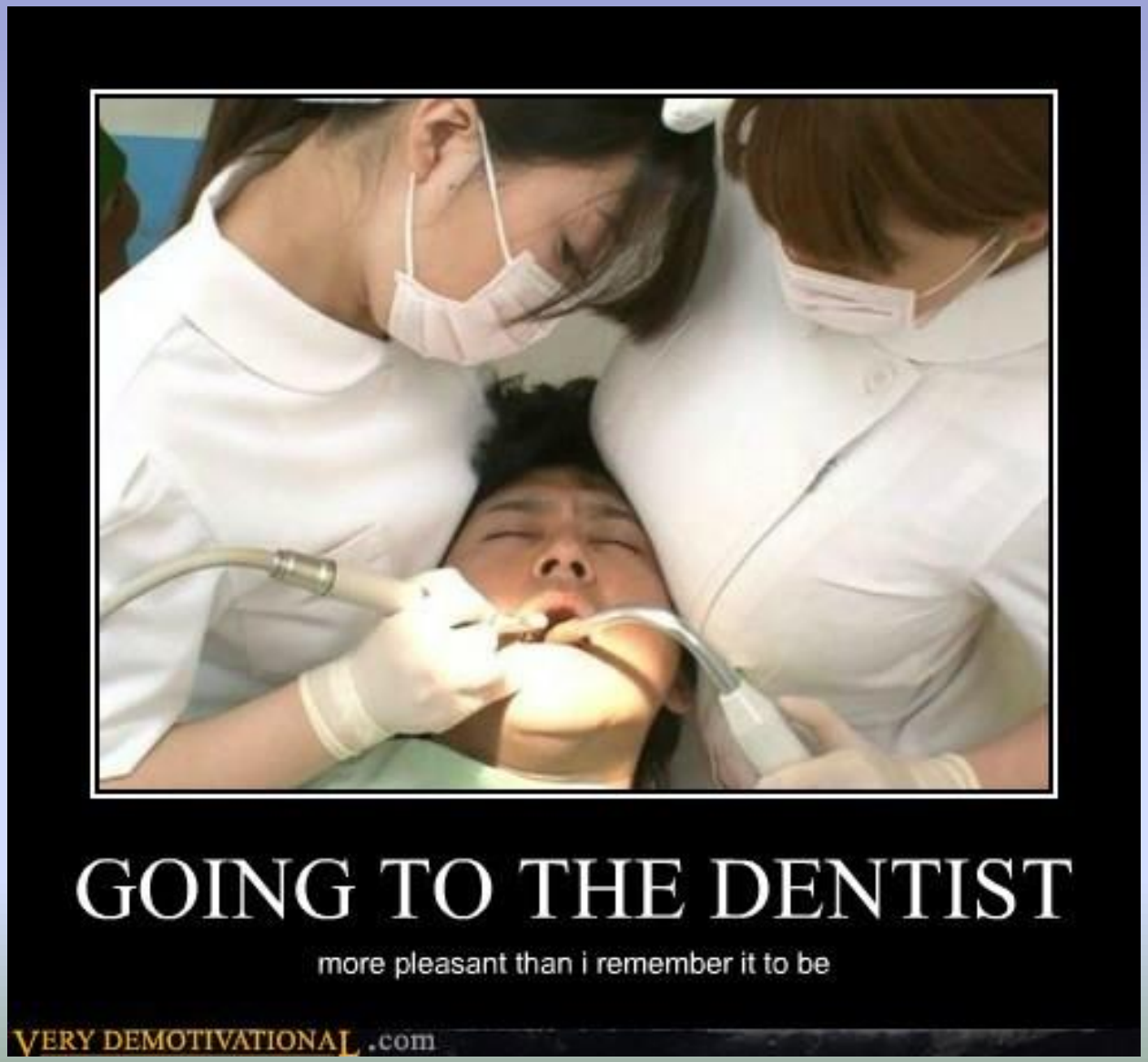
Bauer B et al. Effect of the combination of music and nature sounds on **pain** and **anxiety** in cardiac surgical patients: a randomized study. Altern Ther Health Med. 2011 Jul-Aug;17(4):16-23.

Louw A, et al.The effect of neuroscience education on **pain**, disability, **anxiety**, and **stress** in chronic musculoskeletal **pain**. Arch Phys Med Rehabil. 2011



Clinician understanding and empathetic
Good treatment planning
Managing patients expectations

Distraction techniques



Management – Alternative

Self empowerment Counselling Acceptance Mindfullness

TNI

- Laughter
- Distraction
- Stress management - relaxation
- Exercise
- Social support
- Hypnosis
- Acupuncture
- Aromatherapy
- Pets
- Hobbies

Tapping into natural resources

TNI

- Maximising downward inhibition of pain
- Sleep
- Hypnotism
- Meditation

- Education…managing expectations……

So have you……

TNI

- Informed the patient? -Consent
- Identified their anxiety level?
  - Index of sedation need IoSN
- Identified if LA is contra-indicated ?
  - Previous LA failed
  - Allergy to LA
  - Spreading infection making LA difficult
  - Operative area

Coulthard P. Estimating the need for dental sedation. 1. The Indicator of Sedation Need (IOSN) - a novel assessment tool. Br Dent J. 2011 Sep 9;211(5):E10
Pretty IA. Estimating the need for dental sedation. 2. Using IOSN as a health needs assessment tool. Br Dent J. 2011 Sep 9;211(5):E11.
Goodwin M Estimating the need for dental sedation. 4. Using IOSN as a referral tool.Br Dent J. 2012 Mar 9;212(5):E9.

Indication for sedation need

TNI

The Indicator of Sedation Need (IOSN)

- An update on pain
- An update on classification of pain
- Perioperative techniques to minimise pain
- **Managing and preventing post operative pain**
- Whats new?
- Surgical methods

So how can we prevent / manage the pain?

Main predictors of Post TMS pain

TNI

- Heat pain perception Thermal thresholds using QST
- Psychological vulnerability

J Orofac Pain. 2010 Spring;24(2):189-96.
Prediction of postoperative pain after mandibular third molar surgery.
Rudin A, Eriksson L, Liedholm R, List T, Werner MU

Management of Pain Process

TNI

Nociception

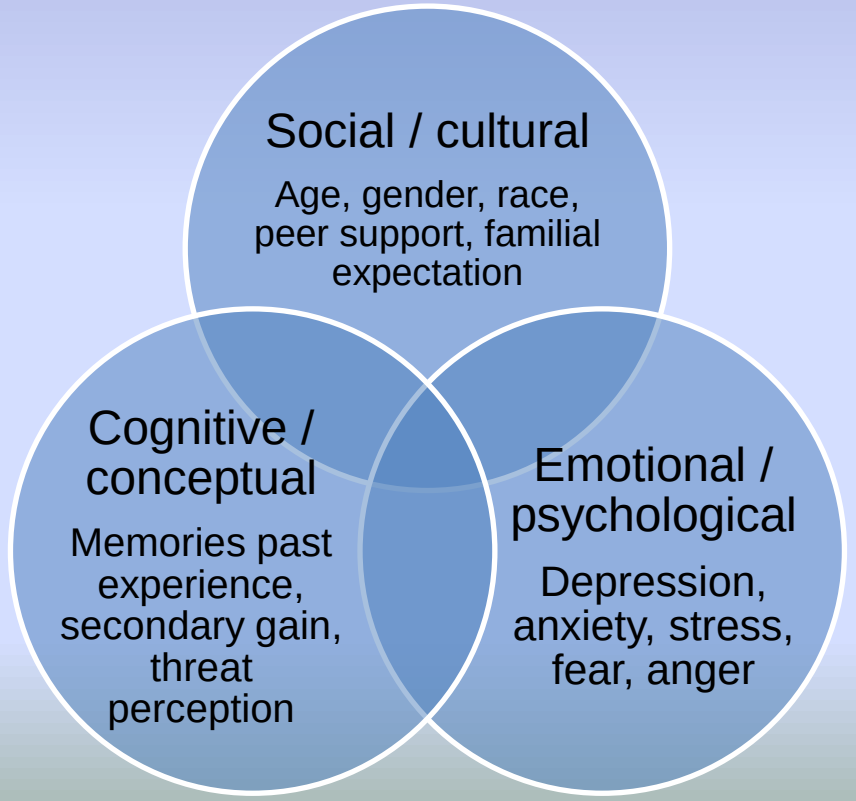
Sensation

Behaviour

Suffering

EASY……..

Use Local anaesthesia to block off nociceptive pain!



Is that it?

TNI

- Sadly not…….
  - Patient is still conscious
  - Anxious
  - Fearful
  - Compliant?

Management of Pain Process

TNI

Nociception

Sensation

Behaviour

Suffering

Depends upon

Clinician role

communication

diagnosis

surgery

medical management

Patient factors

Pre operative

Information

Anxiolysis

Analgesia

LA

Pre-emptive analgesia

TNI

- **Some benefit**
- Dahl JB, Kehlet H. Preventive analgesia. Curr Opin Anaesthesiol. 2011;24(3):331-8. Epub 2011/04/12.
- Dahl JB, Moiniche S. Pre-emptive analgesia. Br Med Bull. 2004;71:13-27. Epub 2004/12/15.

?

- **No benefit**
- **Yong SL, Coulthard P . Pain after surgery: can protective analgesia reduce pain? A randomised clinical trial. Int J Surg.2010;8(4):283-9. Epub 2010 Mar 17.**
- Al-Sukhun JPreemptive analgesic effect of low doses of celecoxib is superior to low doses of traditional nonsteroidal anti-inflammatory drugs. J Craniofac Surg. 2012 Mar;23(2):526-9.
- Zacharias M, Hunter KM, Baker AB. Effectiveness of preoperative analgesics on postoperative dental pain: a study. Anesth Prog. 1996;43(3):92-6. Epub 1996/07/01.

INTERNATIONAL JOURNAL OF SURGERY

Pain after surgery: Can protective analgesia reduce pain? randomised clinical trial

Sin Leong Yong, Paul Coulthard
School of Dentistry, The University of Manchester, Higher Cambridge Street, Manchester M13 9PL, UK

Received: May 19, 2009; Received in revised form: February 15, 2010; Accepted: March 3, 2010; Published Onlin 2010

DOI: http://dx.doi.org/10.1016/j.ijsu.2010.03.001

pain control, safety and tolerability profiles were also recorded.

Results

122 patients entered the study providing 98 evaluable patients for analysis. Patients in the protective reported more pain than those in the conventional group at 30 min, 1, 6 and 48 h following surgery, al difference was only statistically significant at the 30 min time point. 62.2% of patients required rescue after surgery. The median time for patients who had to take rescue analgesia was 3.1 h. Patients in th analgesia group reported a longer time to rescue analgesia compared with those in conventional anal Overall, 91.7% of patients were at least satisfied with their pain control.

Conclusion

There was no difference in the protective analgesia group compared with conventional analgesia group in improving postoperative pain experience. A different protective analgesia regime may be necessary, which employs a more aggressive and multimodal strategy for postoperative pain management.

Keywords:

Intervention Review

Preoperative analgesics for additional pain relief in children and adolescents having dental treatment

Paul F Ashley[1,*], Susan Parekh[1], David R Moles[2], Prabhleen Anand[1], Amal Behbehani[1]

Database Title: The Cochrane Library

Editorial Group: Cochrane Oral Health Group

Published Online: 12 SEP 2012

Assessed as up-to-date: 10 JUL 2012

DOI: 10.1002/14651858.CD008392.pub2

Am score 15

Additional Information (Show All)

How to Cite | Author Information | Publication History

Manage the Pain Process

TNI

~~Nociception~~

~~Sensation~~

~~Behaviour~~

~~Suffering~~

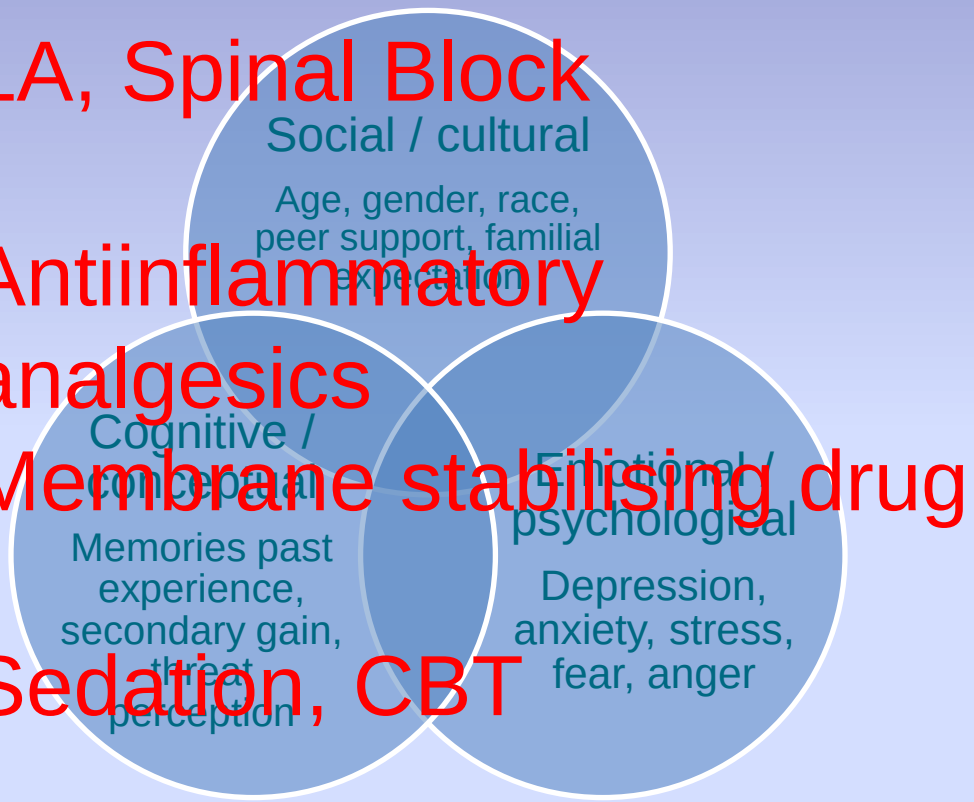
LA, Spinal Block

Antiinflammatory analgesics

Membrane stabilising drug

Sedation, CBT

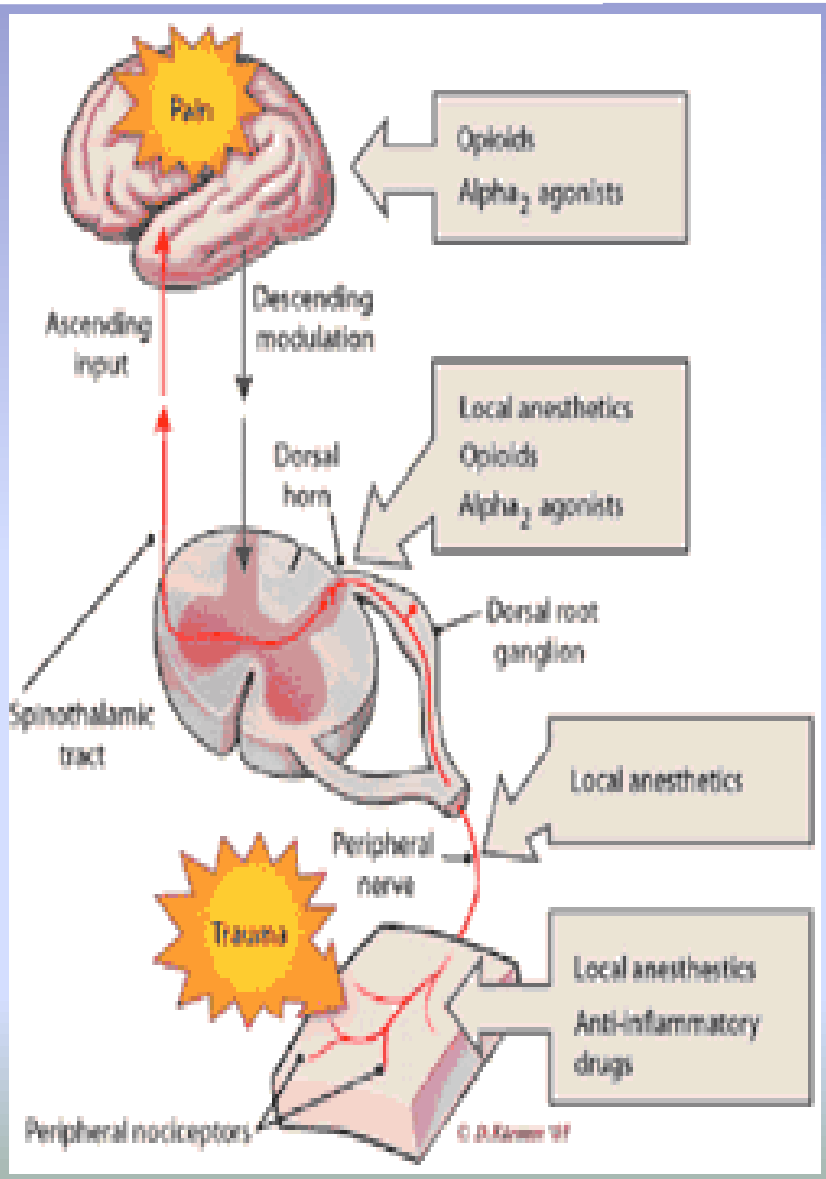
CBT



Where do drugs work?

TNI

- Opiates central block of NMDA receptors
- Tramadol is a very weak μ-opioid receptor agonist,induces serotonin re lease, and inhibits the reuptake of norepinephrine
- Sedation blocks central GABA receptor pathway = anxiolytic
- Paracetamol:– cyclooxygenase inhib, induces serotonin release,
- NSAIDS peripheral block - cyclo oxygenase
- Local analgesia blocks all sodium nerve channels (motor and sensory)



Actual LA nerve injury incidence

- GDP restorative procedures
- 1 in 14K
- 25% permanent

- Oral surgery
- 1 in 3.3K
- 29% permanent

Compare this with anaesthetic LA block procedures.
NAP3 reports the estimated that nerve injury resulting from neuroaxial blocks (epidurals, spinals and combined epidural with spinals) resulted in sensory or motor nerve injury in 1 in 24-54K patients
(and paraplegia or death in 1 in 50-140K patients)

Local anaesthesia

Smart LA

- Articaine 4% Buccal Infiltration
- +/- IDB Lidocaine 2%

- Articaine 4% Buccal Infiltration
- Post + ant near Mental forame
- +/- Lingual Inf Lidocaine 2%

- Buccal infiltration + Lingual bo Lidocaine 2%

Meechan JG The use of the mandibular infiltration anesthetic technique in adults. J Am Dent Assoc. 2011 Sep;142 Suppl 3:19S-24S.

Local anaesthesia

TNI

No palatal blocks required!

- Anesth Prog. 2013 Summer;60(2):42-5. doi: 10.2344/0003-3006-60.2.42. Comparison of buccal infiltration of 4% articaine with 1 : 100,000 and 1 : 200,000 epinephrine for extraction of maxillary third molars with pericoronitis: a pilot study.
- Lima JL Jr, Dias-Ribeiro E, Ferreira-Rocha J, Soares R, Costa FW, Fan S, Sant'ana E. Prospective, double-blind, controlled clinical trial involved 30 patients between the ages of 15 and 46 years who desired extraction of a partially impacted upper third molar with pericoronitis

Prospective audit 280 extractions by dental UGs
-no palatal blocks given
- Articaine infiltration
- Lidocaine IDB rescue

Successful extractions in

Incisors-premolars 90%
M1Ms 60%
M2Ms 75%

87% success!

Medical pain management

TNI

- Anxiolysis
  - Chairside manner- Education & reassurance
  - Hypnosis
  - Acupuncture
  - Indication for sedation need
    - Oral, inhalational, IV sedation
- Analgesia
  - Pre-operative analgesia
  - Intraoperative- LA
  - Post operative
    - paracetamol + ibuprofen **GOLD standard** for third molar surgery / extractions
- Review/ Homecheck

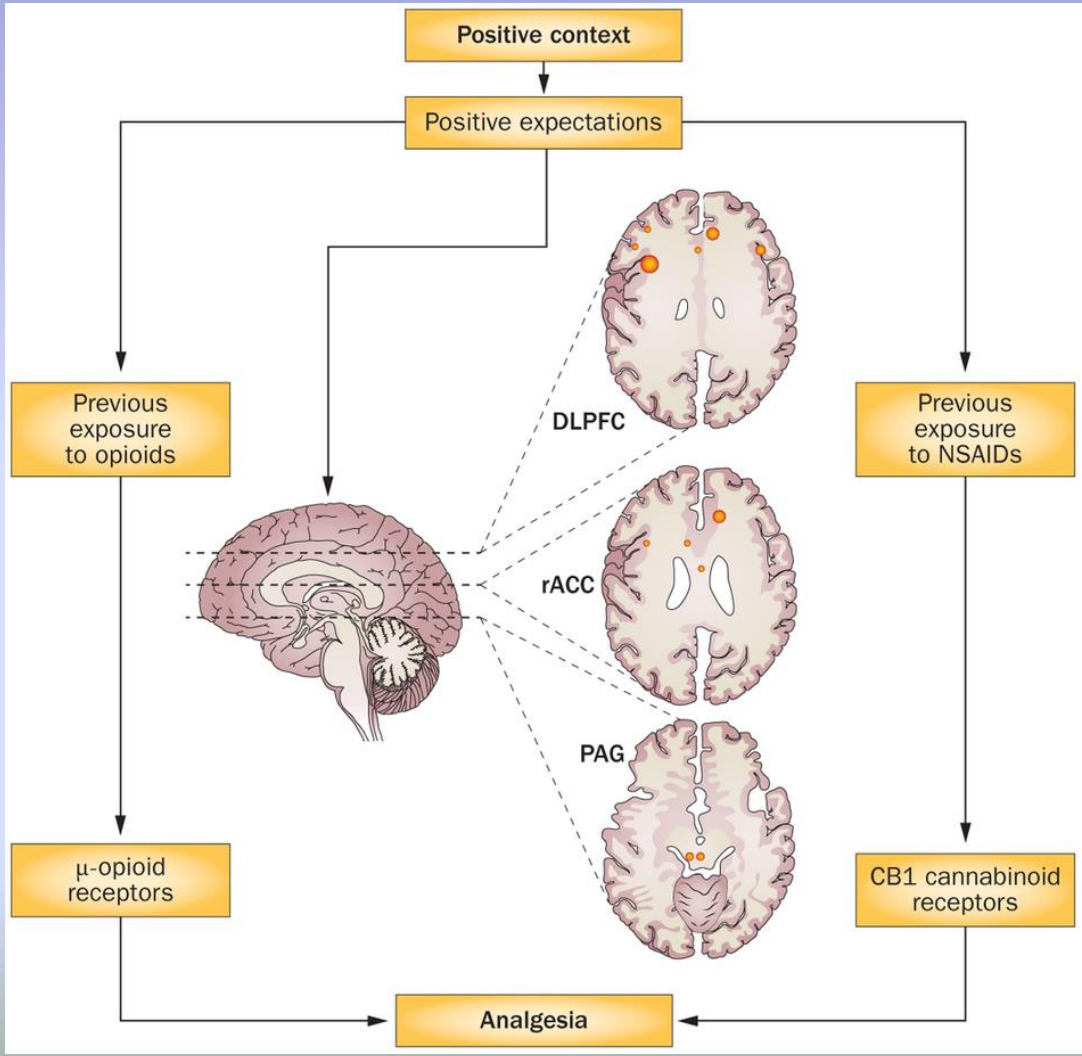
Post surgical pain

TNI

- Nat Med. 2010 Nov;16(11):1277-83. doi: 10.1038/nm.2229. Epub 2010 Oct 14.
- **Getting the pain you expect: mechanisms of placebo, nocebo and reappraisal effects in humans.**
- Tracey I.
- **Author information**
- **Abstract**
- The perception of pain is subject to powerful influences. Understanding how these are mediated at a neuroanatomical and neurobiological level provides us with valuable information that has a direct impact on our ability to harness positive and minimize negative effects therapeutically, as well as optimize clinical trial designs when developing new analgesics. This is particularly relevant for placebo and nocebo effects. New research findings have directly contributed to an increased understanding of how placebo and nocebo effects are produced and what biological and psychological factors influence variances in the magnitude of the effect. The findings have relevance for chronic pain states and other disorders, where abnormal functioning of crucial brain regions might affect analgesic outcome even in the normal therapeutic setting

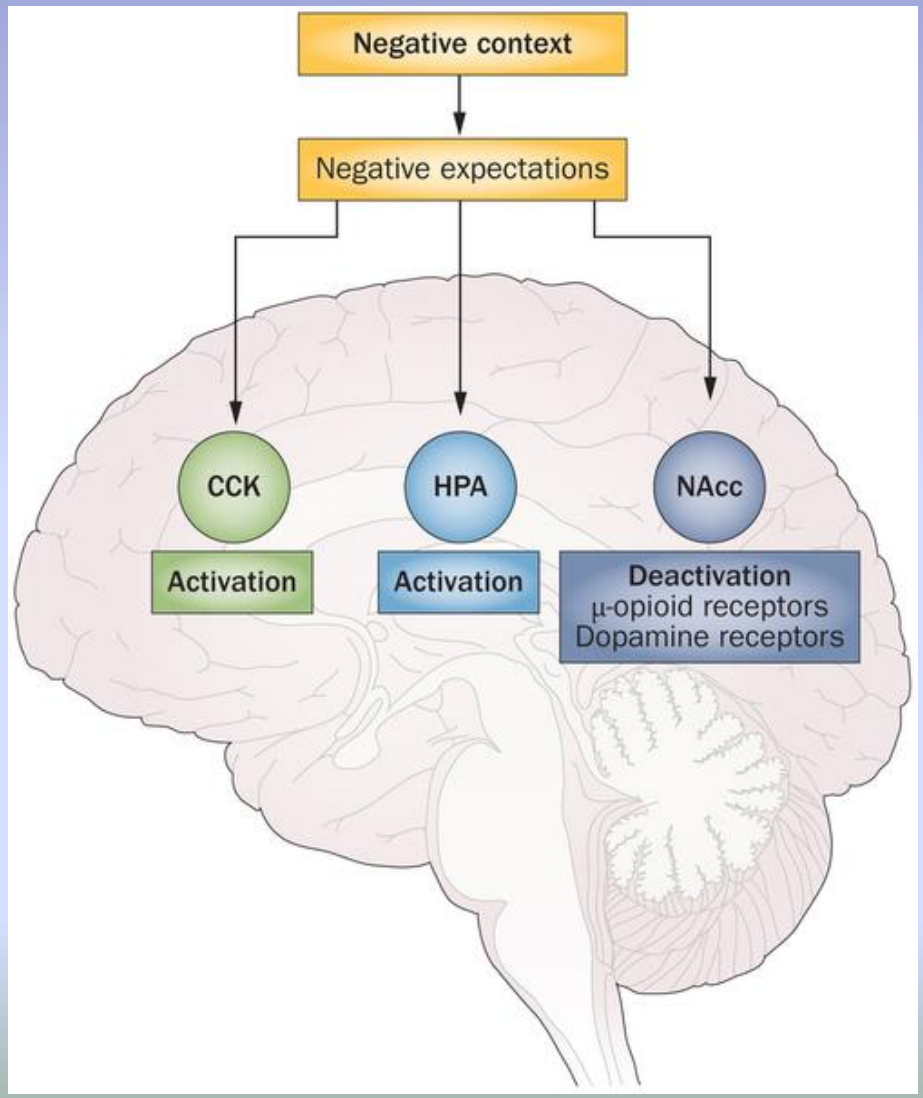
Post surgical pain
Patients get the pain they expect

TNI



Post surgical pain
Patients get the pain they expect

TNI



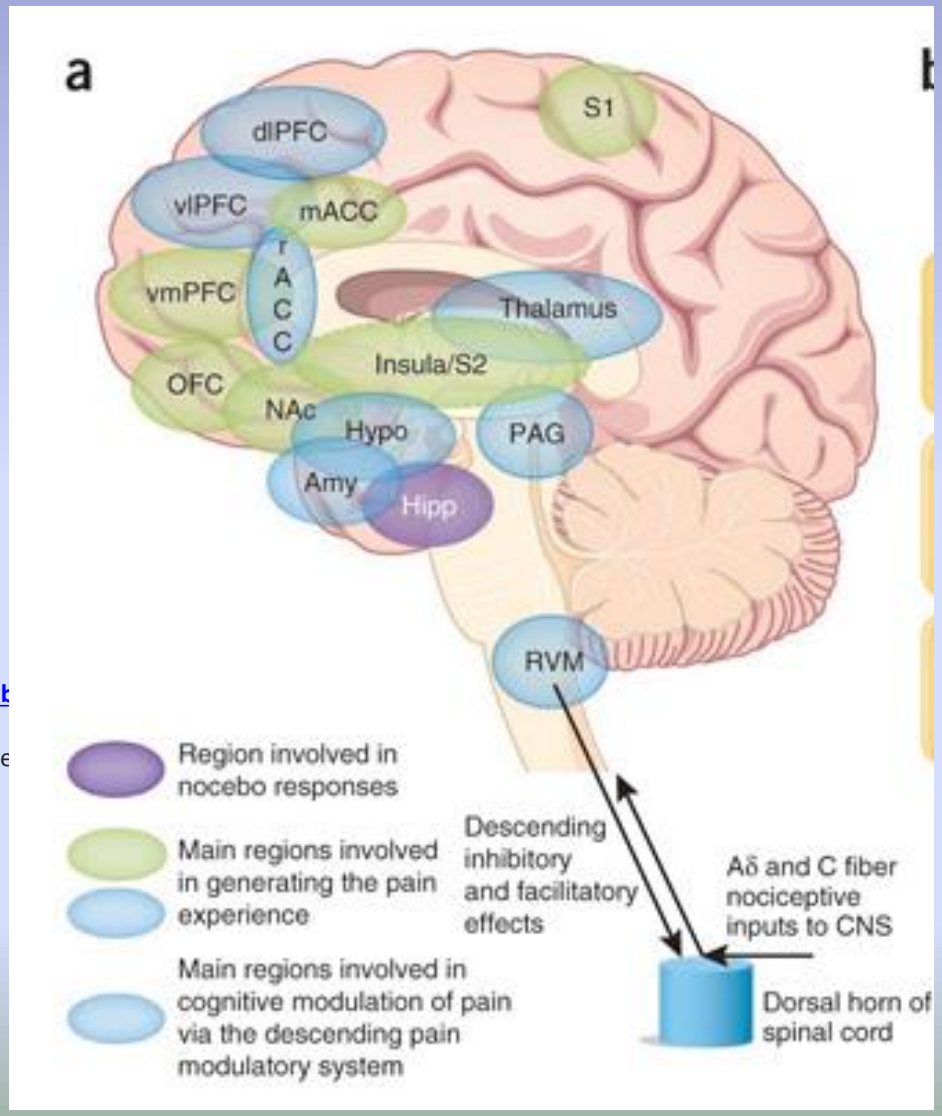
Pain and the context

- Elisa Carlino,
- Elisa Frisaldi
- & Fabrizio Benedetti
- Affiliations
- Contributions
- Corresponding author

Nature Reviews Rheumatology
10,
348–355
(2014)
doi:10.1038/nrrheum.2014.17
Published online

Post surgical pain
Patients get the pain they expect

TNI



Getting the pain you expect: mechanisms of placeb
Irene Tracey
Nature Medicine 16, 1277–1283 (2010)Pain and the

•**Elisa Carlino**,
•**Elisa Frisaldi**
•**& Fabrizio Benedetti**
•**Affiliations**
•**Contributions**
•**Corresponding author**

Nature Reviews Rheumatology
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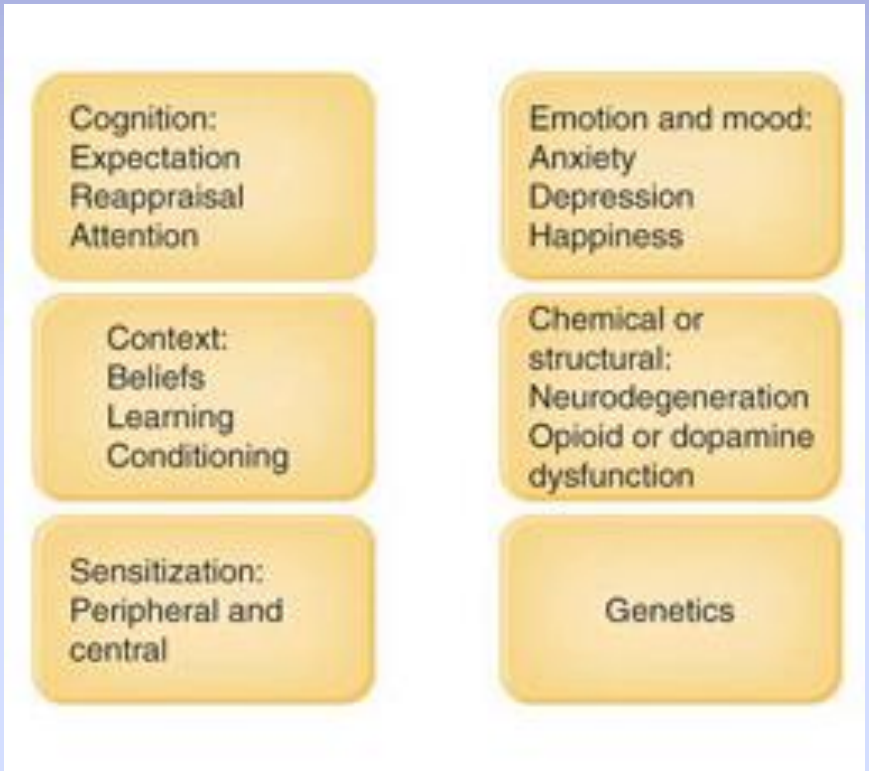
Post surgical pain
Patients get the pain they expect

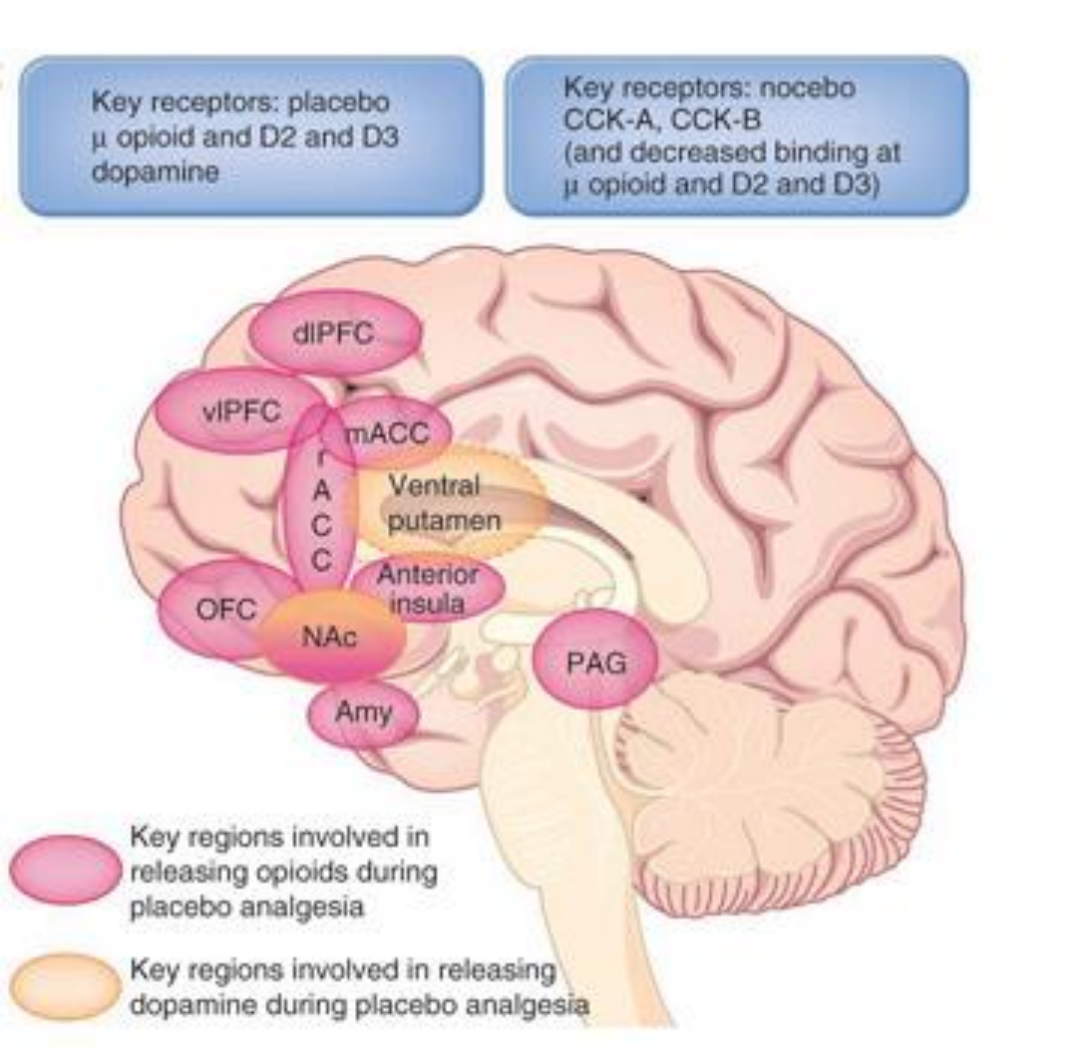
TNI



Getting the pain you expect: mechanisms of placebo, nocebo and reappraisal effects in humans
Irene Tracey
Nature Medicine 16, 1277–1283 (2010)

Placebo effect-hypnosis, meditation, suggestion

TNI



Getting the pain you expect: mechanisms of placebo, nocebo and reappraisal effects in humans
Irene Tracey
Nature Medicine 16, 1277–1283 (2010)

Analgesics

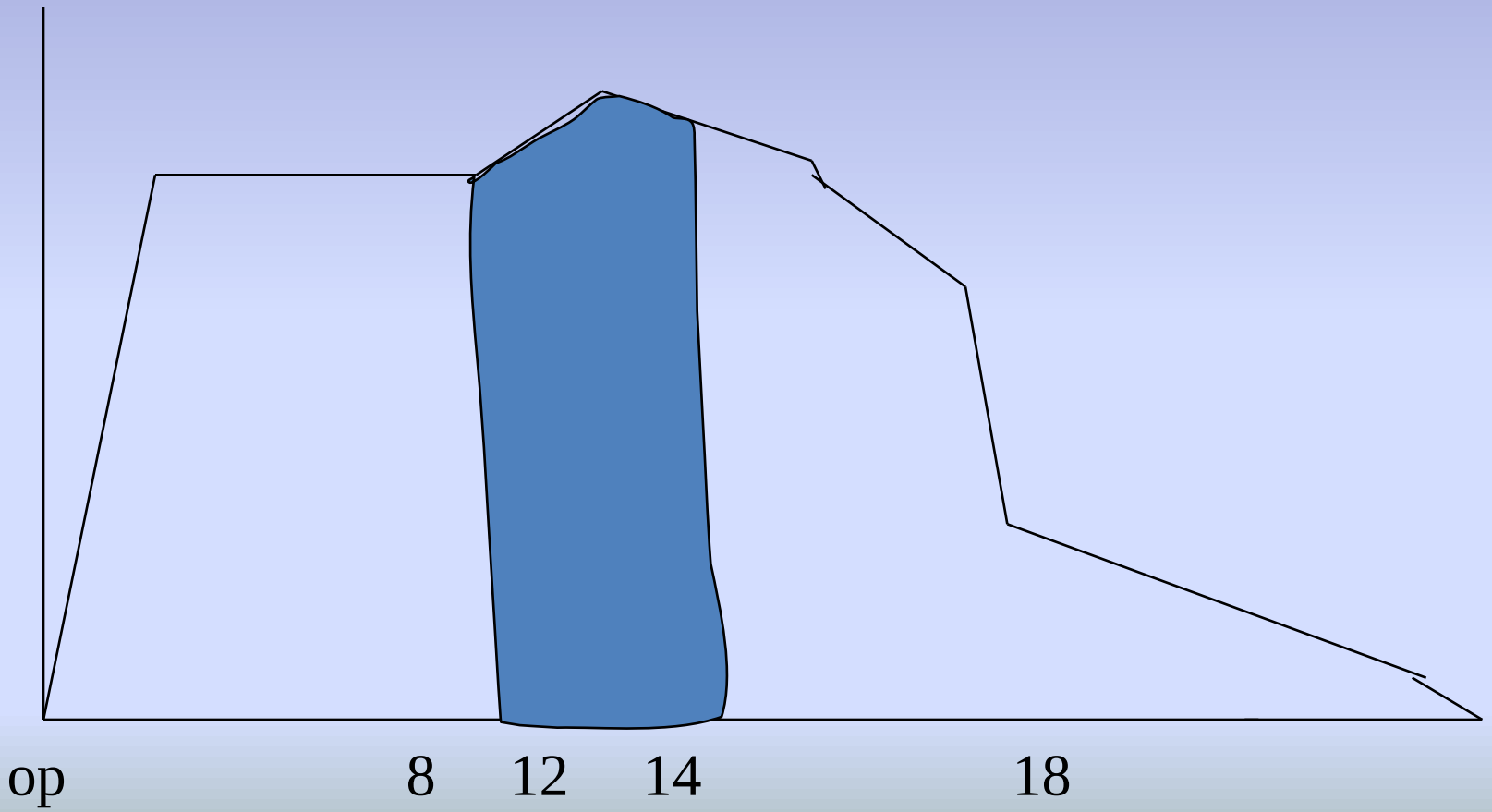
- Pre prandial
- During
- Post prandial

Optimal timing for analgesia

worst pain happens at 2-4am after surgery

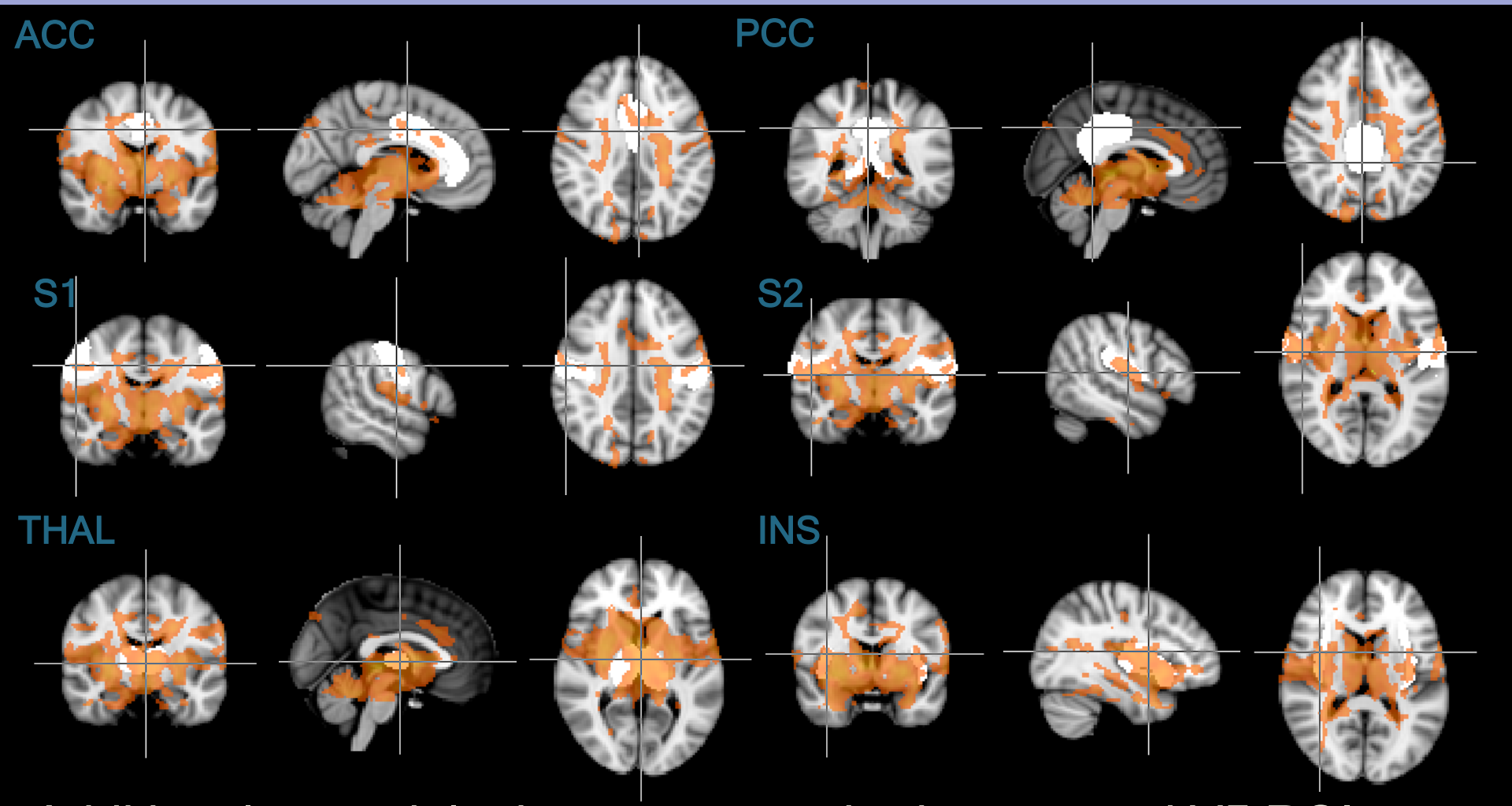
TNI

Seymour J. J One Day Surg 1997



Anatomy revisited

TNI



- Additional amygdala, hippocampus, brainstem, and V5 ROIs

Level of pain

TNI

Drives analgesic selection
What is the level of Post TMS pain?

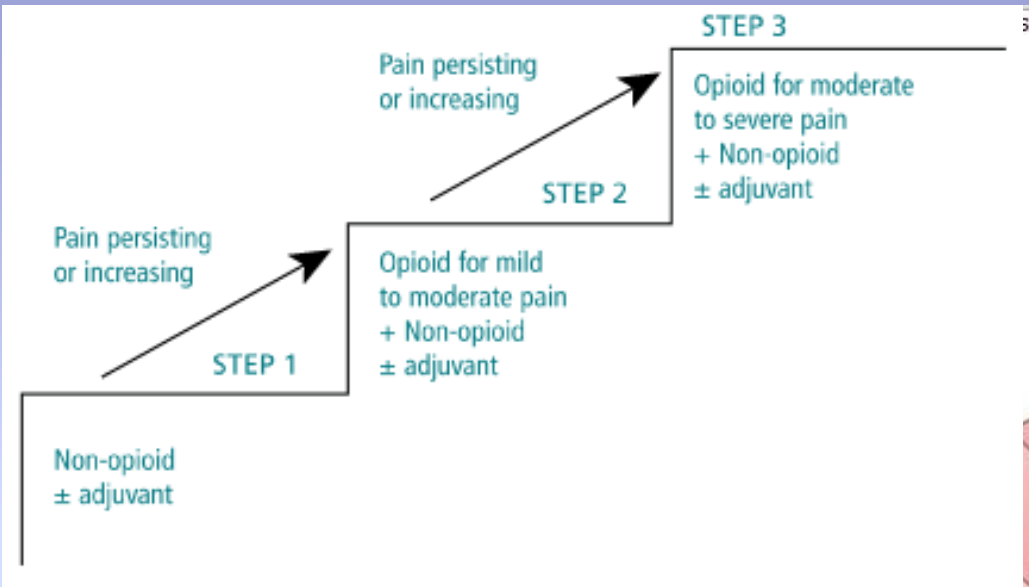
UK reported pain levels 3-5
USA reported pain levels >7

?

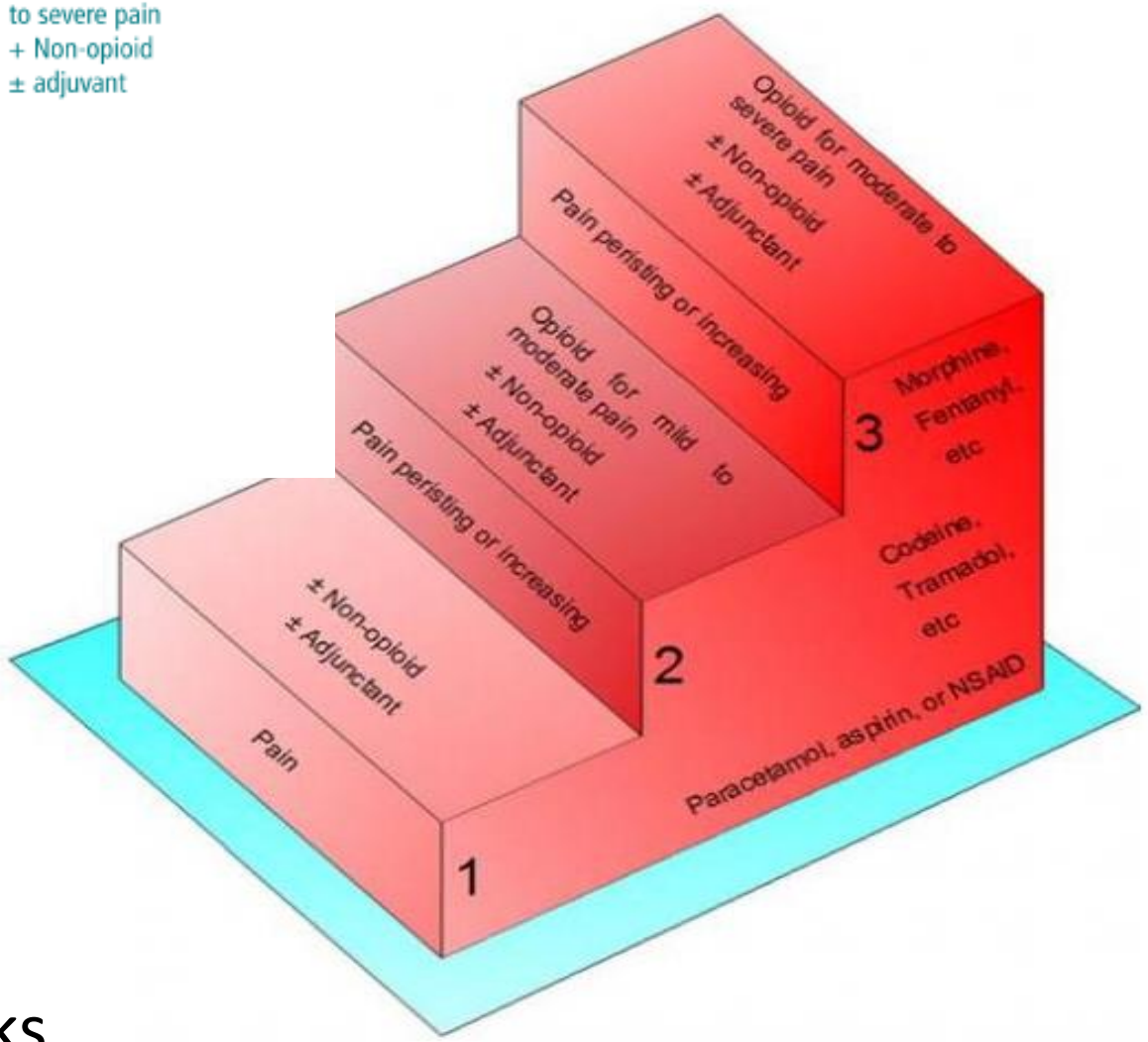
Averbuch M, Katzper M **Severity of baseline pain and degree of analgesia in the third molar post-extraction dental pain model.** Anesth Analg. 2003 Jul;97(1):163-7

Medical- analgesics
WHO analgesic ladder

TNI



sis of the WHO Analgesic Ladder and has subsequently inform



<u>Rescue medication</u>

NSAIDs

Tramadol

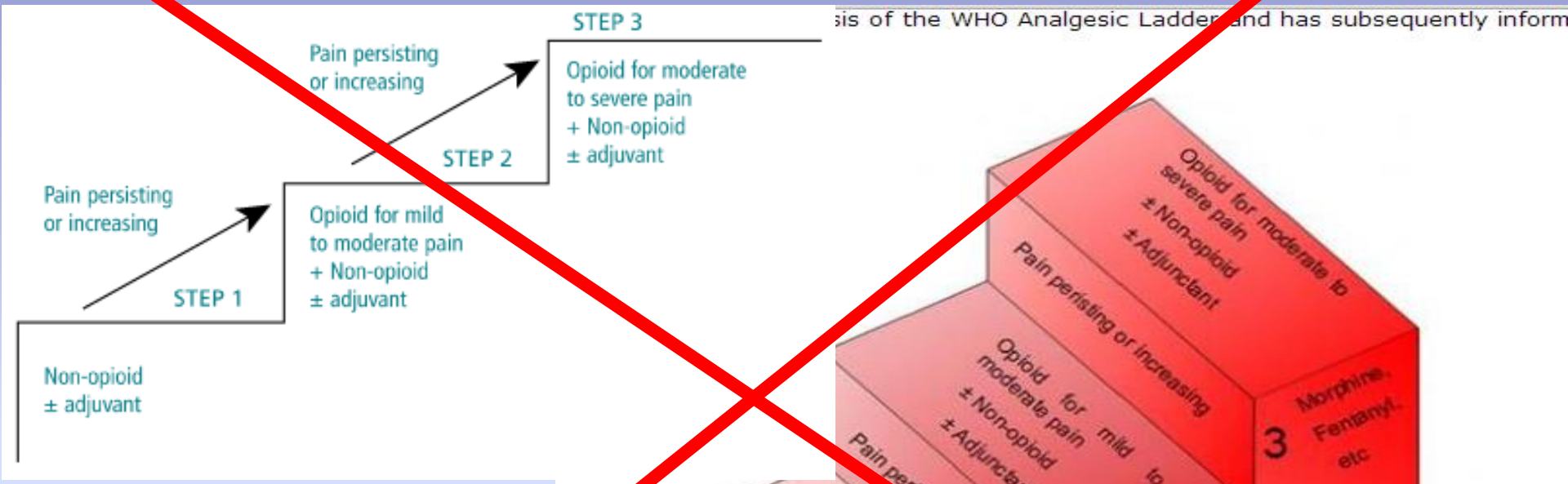
Pethidine

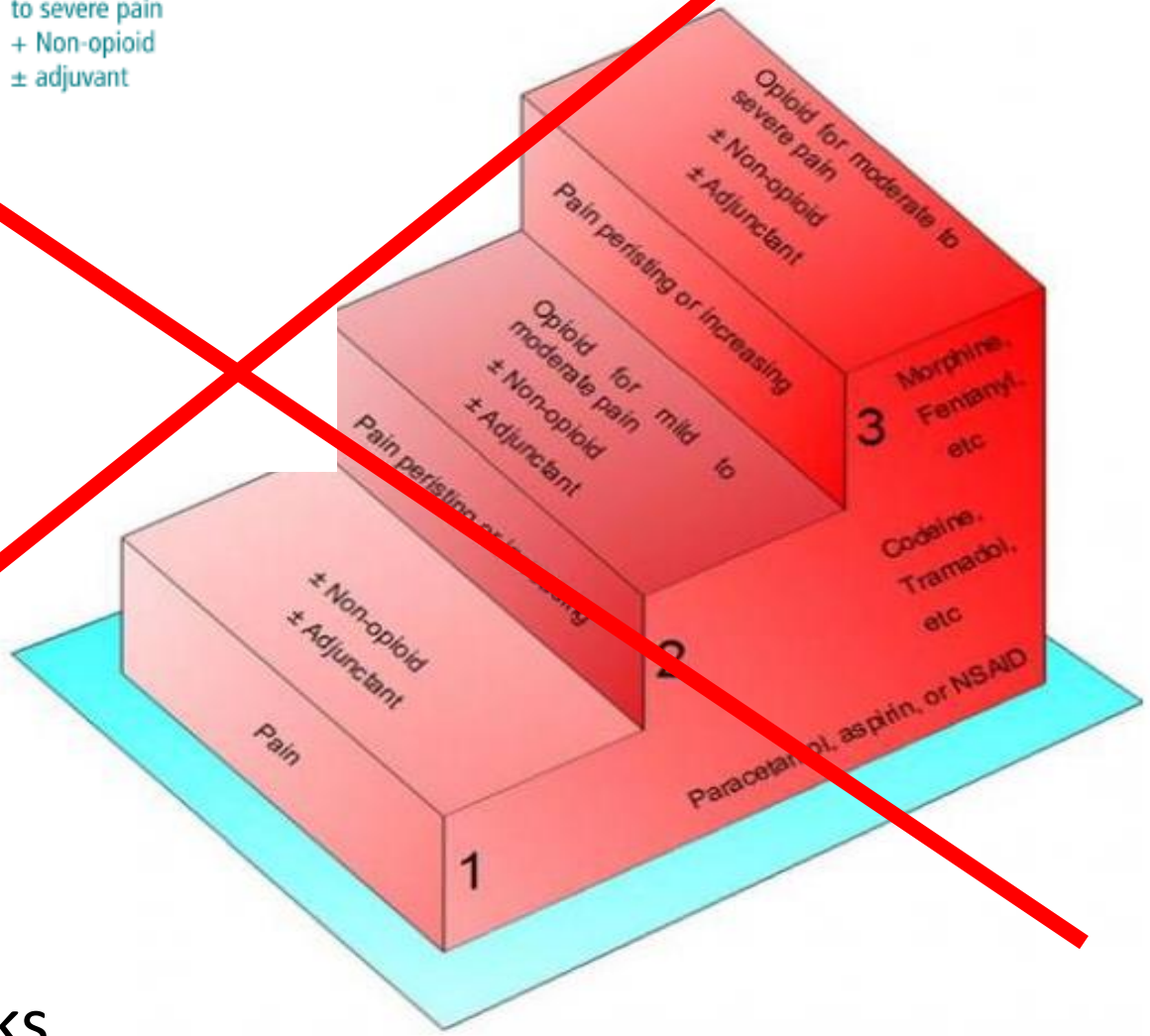
Morphine

IV lidocaine/LA blocks

Medical- analgesics
WHO analgesic ladder

TNI





Rescue medication

NSAIDs

Tramadol

Pethidine

Morphine

IV lidocaine/LA blocks

TMS post op pain control confusion

TNI

Single dose paracetamol (1g) 50% post op pain relief for 4 hours

Toms L, McQuay HJ, Derry S, Moore RA. Single dose oral paracetamol (acetaminophen) for postoperative pain in adults. Cochrane Database Syst Rev. 2008 Oct 8;(4):CD004602.

Codeine not effective as NSAIDs or paracetamol for TMS pain

Derry S, Moore RA, McQuay HJ. Single dose oral codeine, as a single agent, for acute postoperative pain in adults**. Cochrane Database Syst Rev**. 2010 Apr 14;(4):CD008099.

Aspirin better than paracetamol for Post TMS pain

- Seymour RA, Hawkesford JE, Sykes J, Stillings M, Hill CM.An investigation into the comparative efficacy of soluble aspirin and solid paracetamol in postoperative pain after third molar surgery. Br Dent J. 2003 Feb 8;194(3):153-7

Review for TMS

Derry S, Wiffen PJ, Moore RA. **Relative efficacy of oral analgesics after third molar extraction--a 2011 update.** Br Dent J. 2011 Nov 11;211(9):419-20. doi: 10.1038/sj.bdj.2011.905.

Synergism paracetamol and NSAIDs

TNI

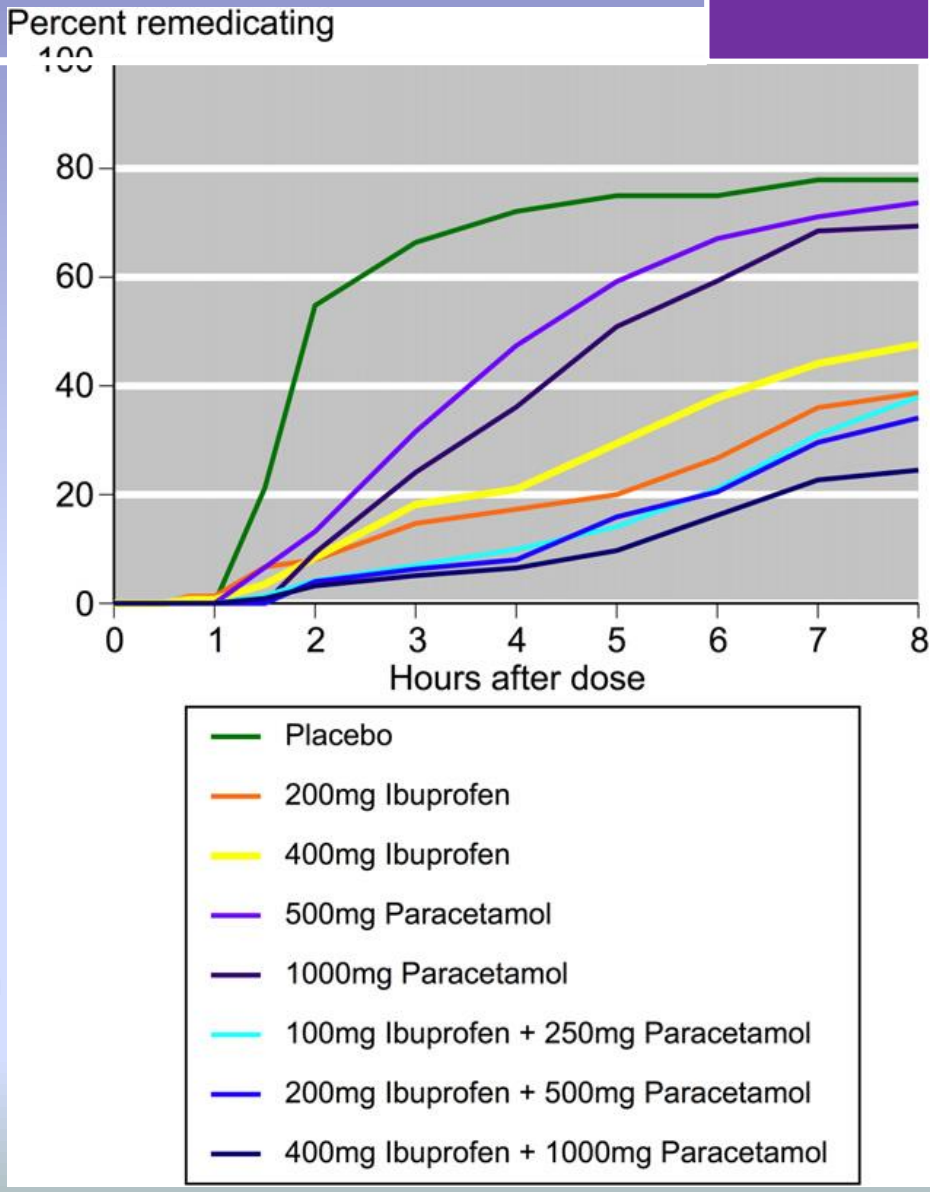
Miranda HF, Puig MM, Prieto JC, Pinardi G. Synergism between **paracetamol** and nonsteroidal **anti-inflammatory** drugs in experimental acute pain. Pain. 2006 Mar;121(1-2):22-8. Epub 2006

- Merry AF et al. Combined acetaminophen and ibuprofen for pain relief after oral surgery in adults: a randomized controlled trial. Br J Anaesth. 2010 Jan;104(1):80-8.

- Merry AF Eur J Clin Pharmacoz. 2009 Apr;65(4):343-53. Epub 2009 Feb 28. Onset of analgesia with sodium ibuprofen, ibuprofen acid incorporating poloxamer and acetaminophen--a single-dose, double-blind, placebo-controlled study in patients with post-operative dental pain.

- 400mg ibuprofen
- With 1000mg
- Paracetamol

- Lowest re-medication rate



Andrew Moore a,⇑, Sebastian Straube b, Jocelyn Paine c, Sheena Derry a, Henry J. McQuay M. PAIN 152 (2011) 982–989**inimum efficacy criteria for comparisons between treatments using individual patient meta-analysis of acute pain trials: Examples of etoricoxib, paracetamol, ibuprofen, and ibuprofen/paracetamol combinations after third molar extraction**

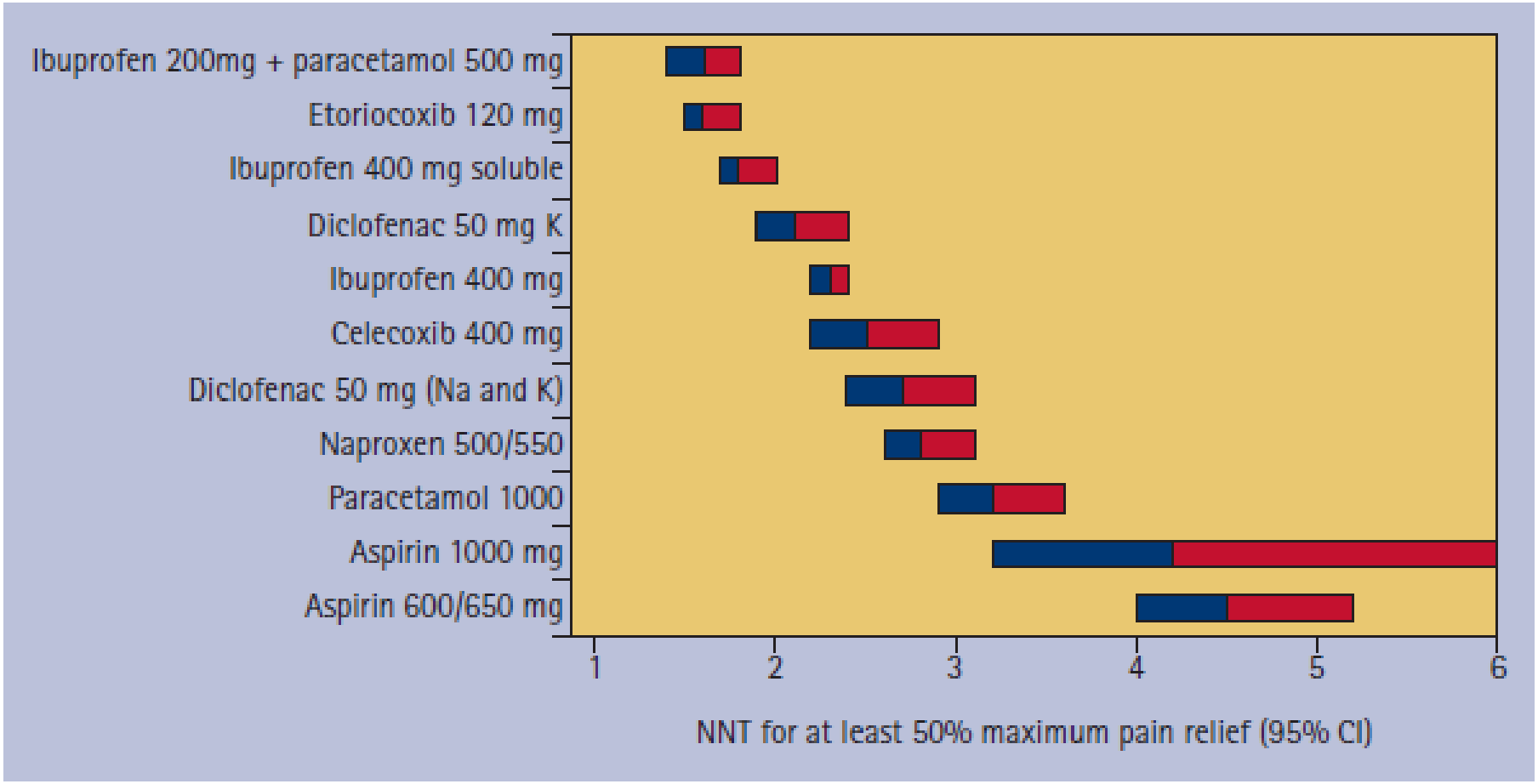


Fig. 1 NNTs in dental pain studies for a range of commonly used analgesics

Derry S, Wiffen PJ, Moore RA. **Relative efficacy of oral analgesics after third molar extraction--a 2011 update.** Br Dent J. 2011 Nov 11;211(9):419-20. doi: 10.1038/sj.bdj.2011.905.

Most commonly prescribed analgesia for TMS

TNI

- 75% US Oral surgeons prescribe Ibuprofen 400mg

Moore PA, Nahouraii HS, Zovko JG, Wisniewski SR. Dental therapeutic practice patterns in the U.S. II. Analgesics, corticosteroids, and antibiotics. Gen Dent. 2006 May-Jun;54(3):201-7; quiz 208, 221-2

- Combined is better- Synergistic effect Ibuprofen+ Paracetamol

Ong CK, Seymour RA, Lirk P, Merry AF. Combining paracetamol (acetaminophen) with nonsteroidal antiinflammatory drugs: a qualitative systematic review of analgesic efficacy for acute postoperative pain. Anesth Analg. 2010;110(4):1170-9. Epub 2010/02/10

Perfalgen- IV paracetamol

TNI

No difference between start up does 2g vs 1g

Juhl GI, Norholt SE, Tonnesen E, Hiesse-Provost O, Jensen TS. Analgesic efficacy and safety of intravenous paracetamol (acetaminophen) administered as a 2 g starting dose following third molar surgery. Eur J Pain. 2006 May;10(4):371-7. Epub 2005 Aug 8.

No difference Pre op Oral vs IV

Moller PL, Juhl GI, Payen-Champenois C, Skoglund LA. Intravenous acetaminophen (paracetamol): comparable analgesic efficacy, but better local safety than its prodrug, propacetamol, for postoperative pain after third molar surgery. Anesth Analg. 2005 Jul;101(1):90-6, table of contents.

Moller PL, Sindet-Pedersen S, Petersen CT, Juhl GI, Dillenschneider A, Skoglund LA. Onset of acetaminophen analgesia: comparison of oral and intravenous routes after third molar surgery. Br J Anaesth. 2005 May;94(5):642-8.

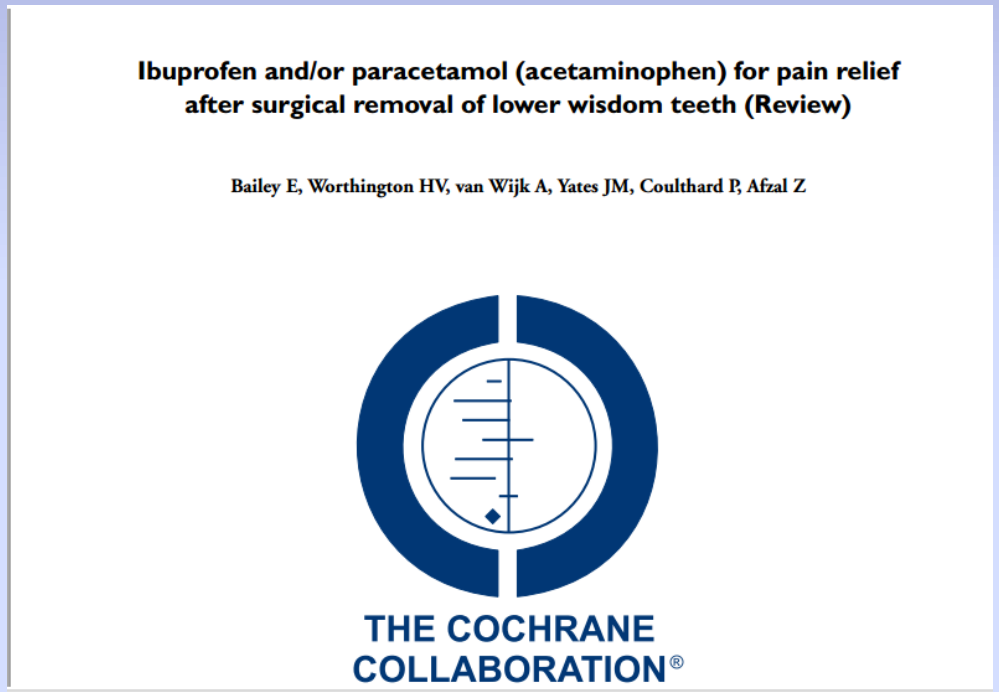
Does drug preparation make a differenc

TNI

Soluble ibuprofen provides earlier pain relief than tablets

Evidence base

TNI



Evidence base

TNI

- Ibuprofen is more effective than paracetamol at all doses studied in this review.
- On limited evidence, the combination of ibuprofen and paracetamol appeared to be no more effective than the single drugs when measured two hours after surgery.
- On limited evidence, it was found to be more effective than the drugs taken singly when measured at six hours after surgery. Participants taking the combined drug also had a smaller chance of requiring rescue medication.
- The information available regarding adverse events from the studies (including nausea, vomiting, headaches and dizziness) indicated that they were comparable between the treatment groups. However, review authors could not formally analyse the data as it was not possible to work out how many adverse events there were in total.

What do I do?

TNI

- Frank consent
- Repeat consent on day of surgery
- No pre-emptive analgsia
- LA +/- sedation
- Post op
  - 4hourly ibuprofen (600mgs) and Paracetamol (1g) orally on day of surgery
  - 2pm, 6pm and 10pm
- Homecheck
- If analgesia required 6 hourly ibuprofen with paracetamol half or full dose

- An update on pain
- An update on classification of pain
- Perioperative techniques to minimise pain
- **Managing and preventing post operative pain**
- **Whats new?**
  - Investigating pain
    - Interactions
    - How drugs work?
    - Long term irreversible consequences of pain
  - Neurostimulation
  - Imaging peripheral branches
  - Surgical methods

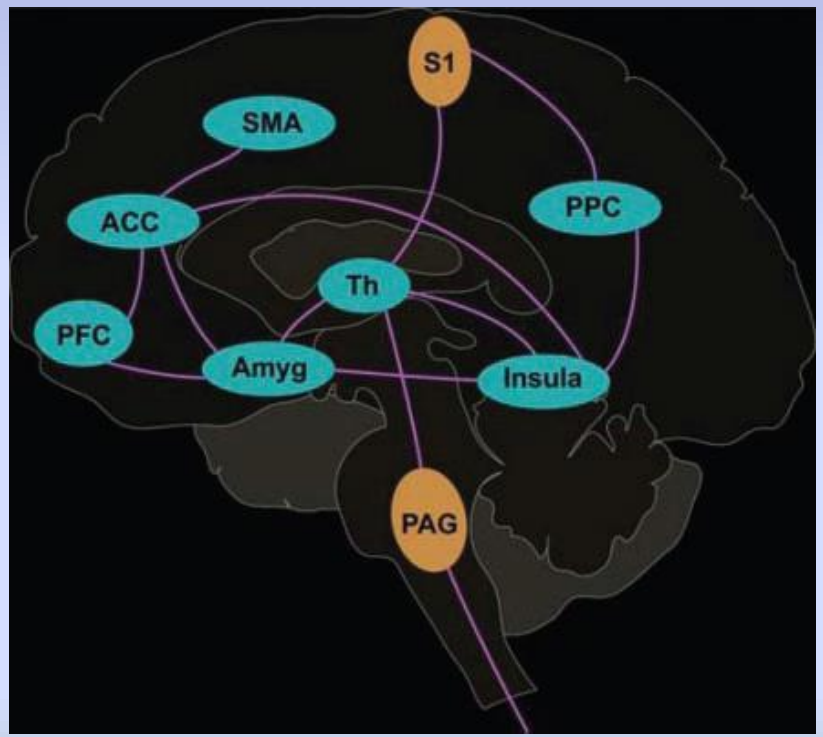
What's new?

Structural Brain Imaging: A Window into Chronic Pain.

Arne May. The Neuroscientist 17(2) 209-220:2011

- **Neuroplasticity**
- Cortical reorganisation
- Gray matter changes
- Central sensitisation
- Maladaptive plasticity
- Downward facilitation
- Downward inhibition

(Placebo effect)



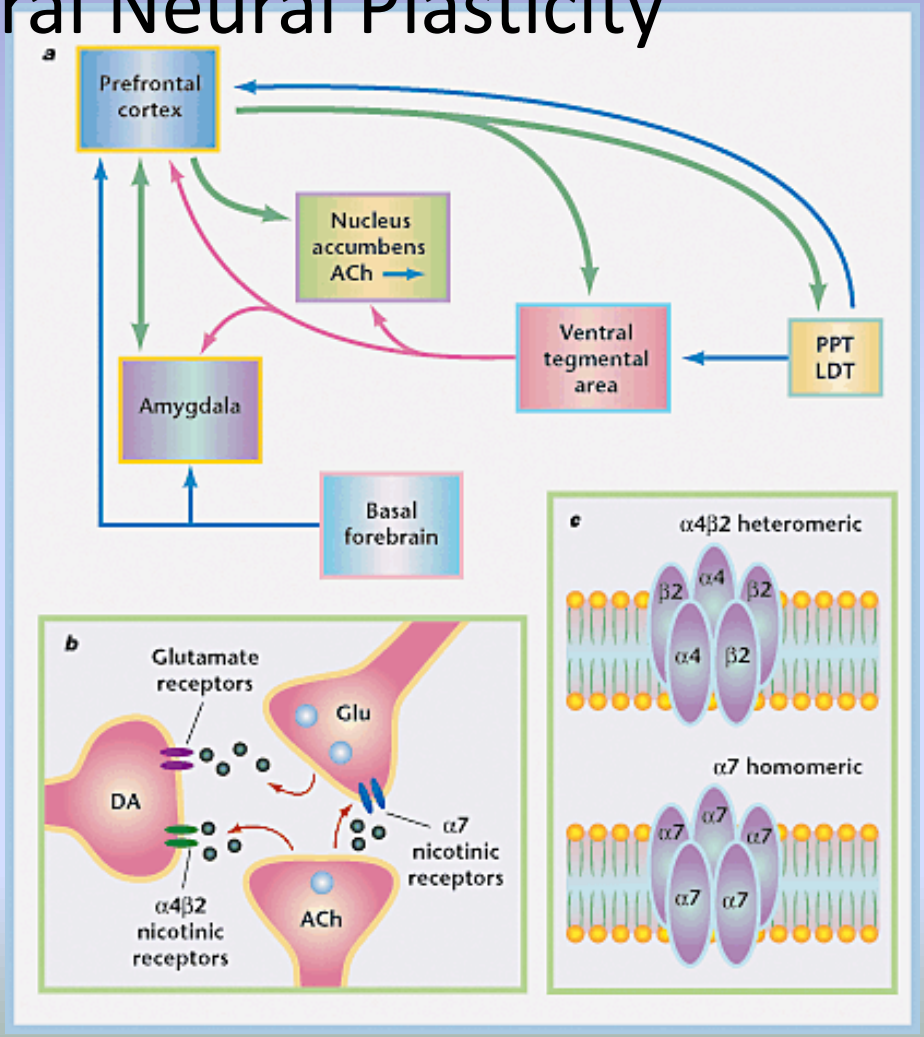
TNI

What's new?

Central Sensitization: A Generator of Pain Hypersensitivity by Central Neural Plasticity

- Facilitation
- Augmentation
- Potentiation
- Amplification

=hypersensitivity



Alban Latremoliere& Clifford J. WoolfCentral Sensitization: A Generator of Pain Hypersensitivity by Central Neural Plasticity.

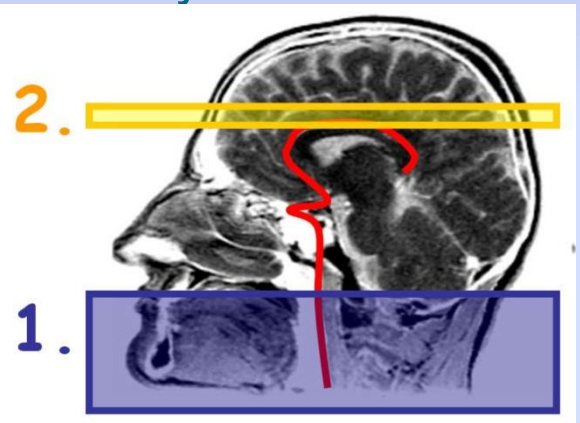
The Journal of Pain Volume 10, Issue 9 , Pages 895-926, September 2009

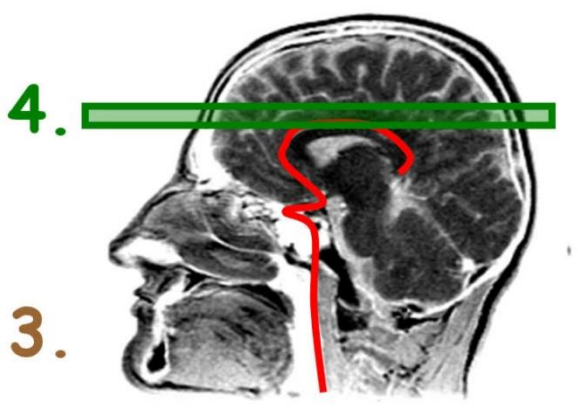
What's new?

TNI

Continuous Arterial Spin Labelling (cASL)

- Novel technique→ quantitative measure of cerebral blood perfusion throughout the brain.
- Examine changes in regional cerebral blood flow (rCBF) to determine physiological perturbation of pathways stimulated by stimulus.
- Arterial blood water protons are magnetically labelled (endogenous tracer) continuously via a continuous 180 continuous RF inversion pulse.





1. **Tag** inflowing arterial blood by magnetic inversion
2. Acquire the **tag image**
3. Repeat experiment without tag
4. Acquire the **control image**

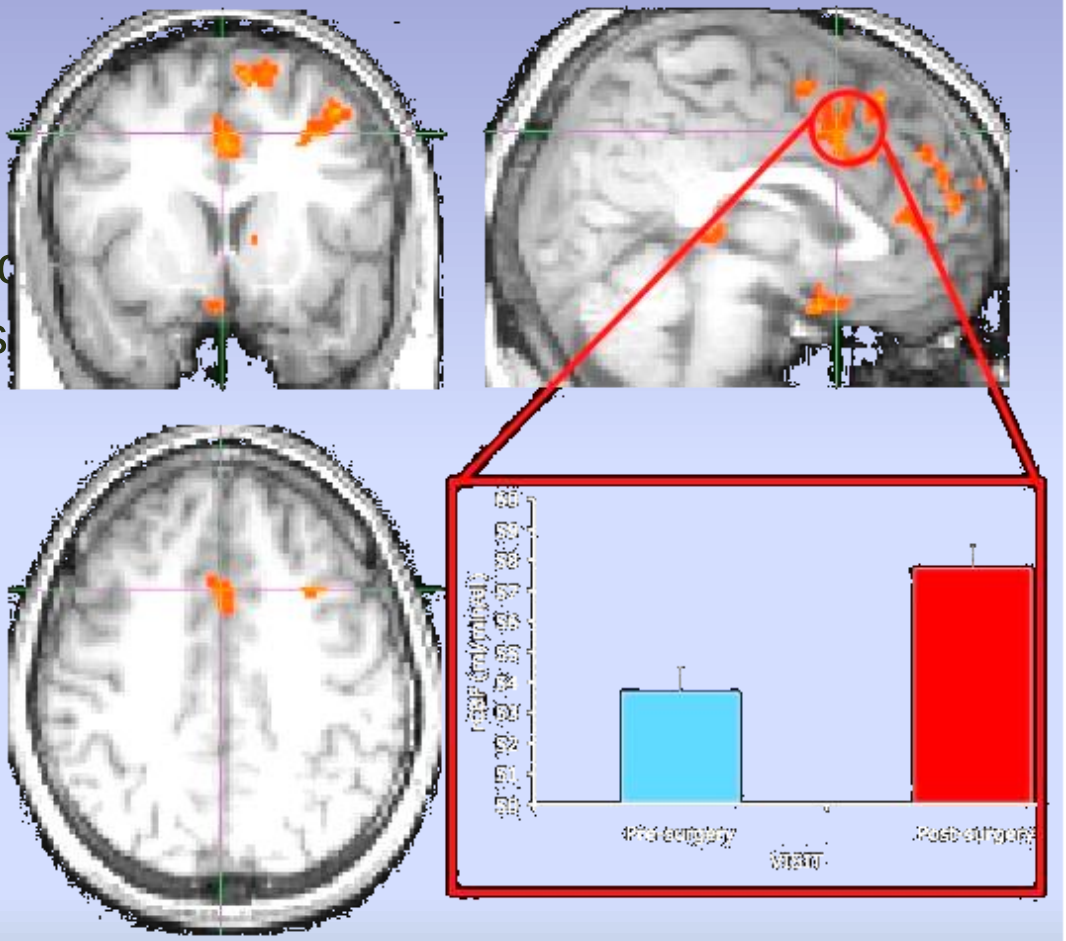
Subtract: **Control image** magnetization - **Tag Image** magnetization **= rCBF**

What's new?

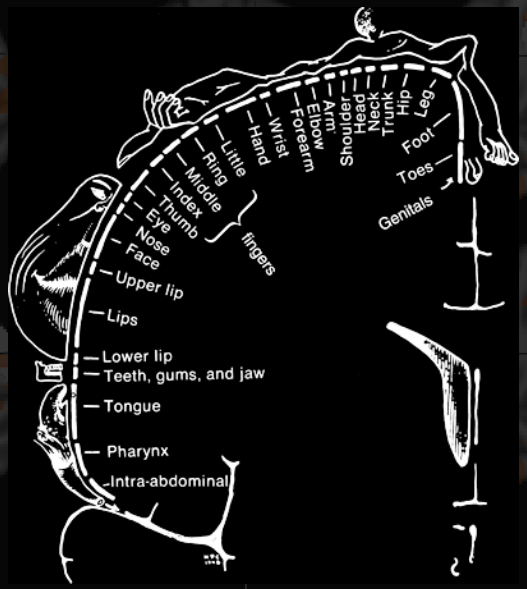
TNI

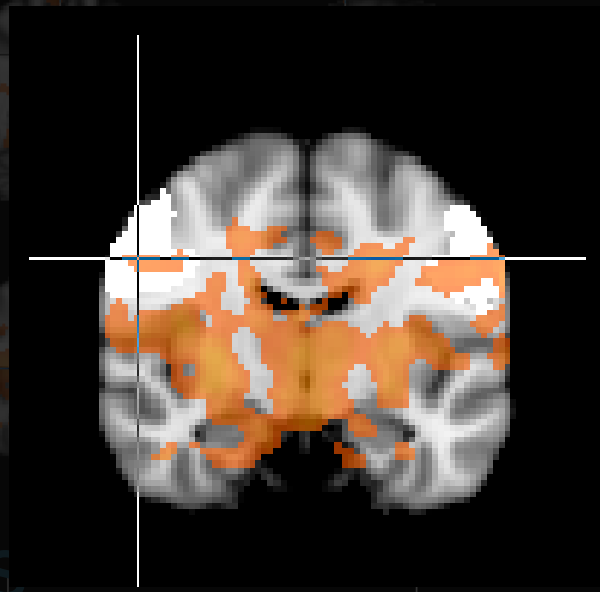
A window into acute pain brain activity

- Pain related areas
  - Spinal cord C1-S5
    - C1-8/T1-12/L1-5/S1-5
    - distal root ganglion
      - » Ventral horn = moto
      - » Dorsal horn = sens
  - Brain stem
    - Cranial nerve
    - Thalamus
    - Hypothalamus
    - Cerebellum
  - Forebrain
    - Cortex-sensation
    - Limbic system -memory
    - Basal ganglia-movement



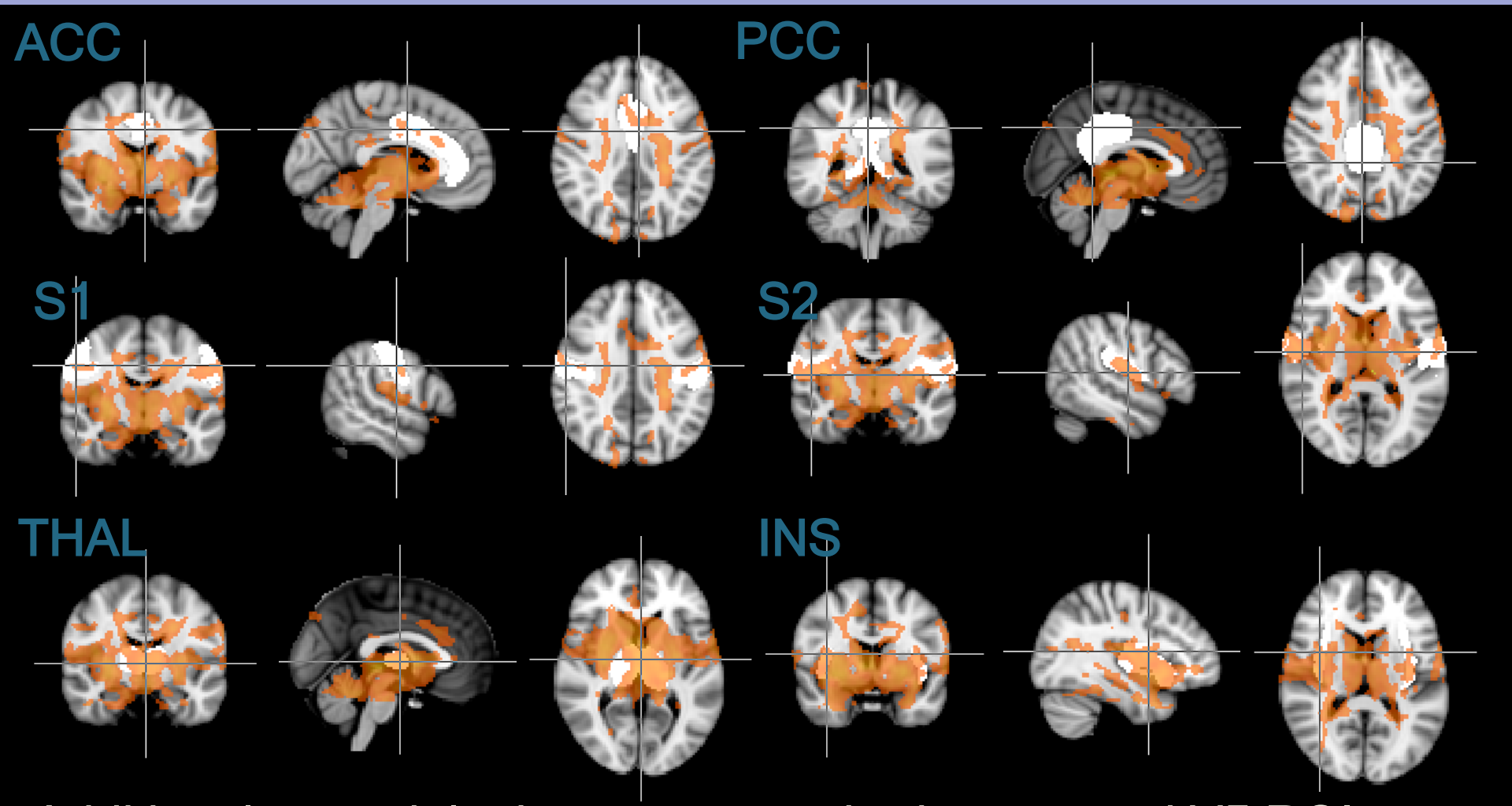
Anatomy revisited





•Additional amygdala, hippocampus, brainstem, and V5 ROIs

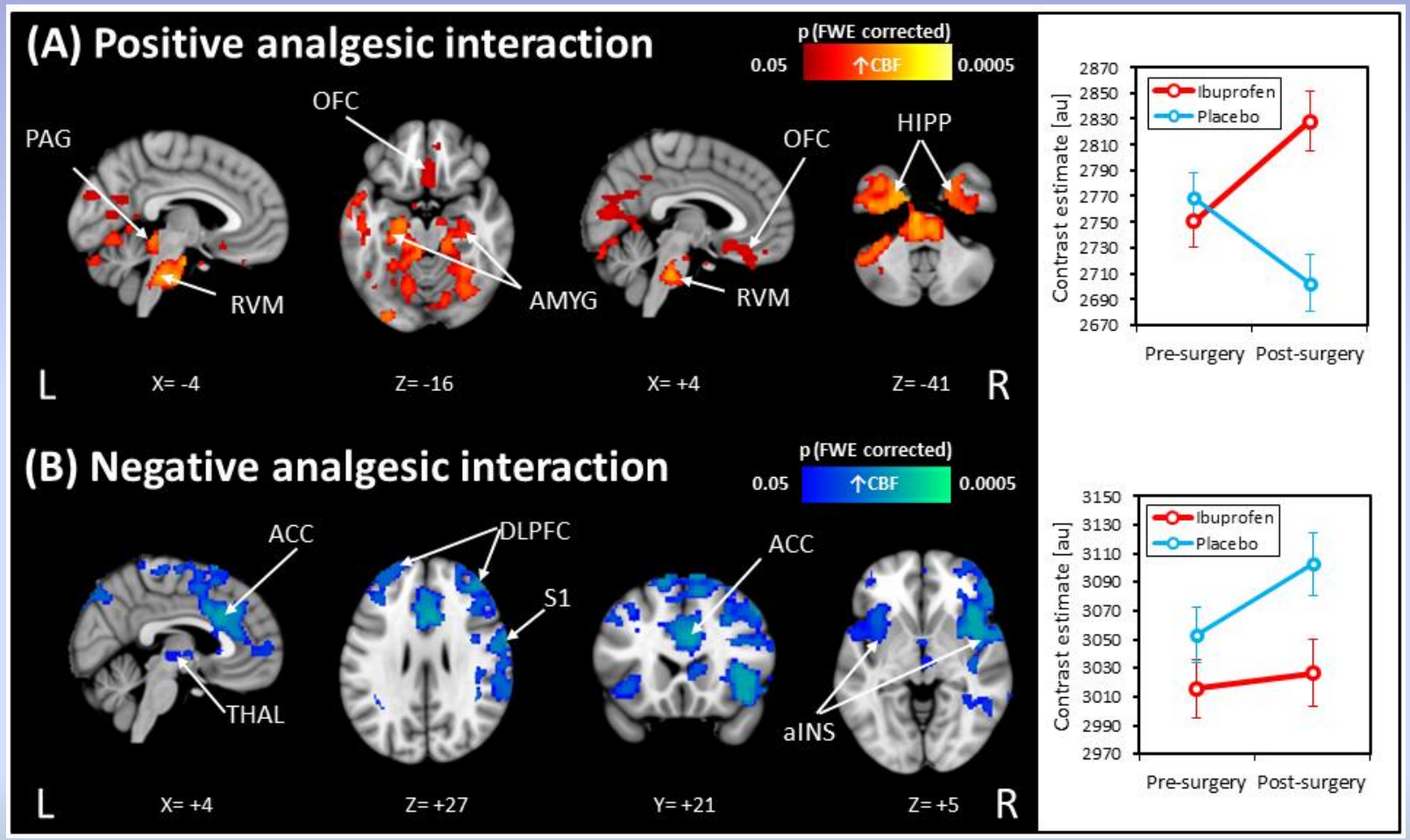
Anatomy revisited



- Additional amygdala, hippocampus, brainstem, and V5 ROIs

TNI

What's new?
How do routine analgesic drugs work?



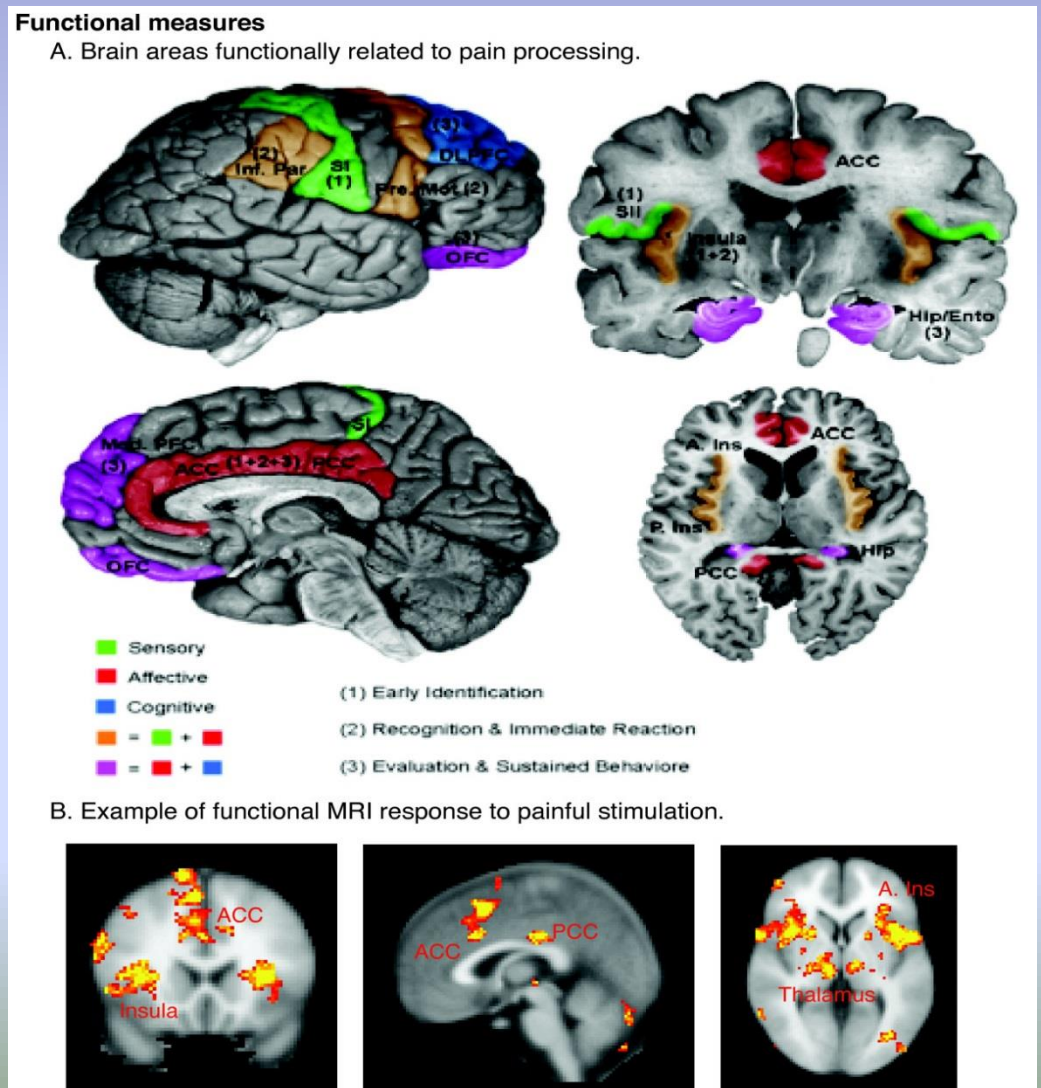
What's new?
Why does pain become chronic?

TNI

Persistent acute stimulus becoming chronic	• Increased sensitivity of CNS to peripheral stimulus
Neuroplasticity	• Interaction between PNS and CNS results permanent changes in system
Memory of pain	• Somatosensory cortex changes
Genetic predisposition	

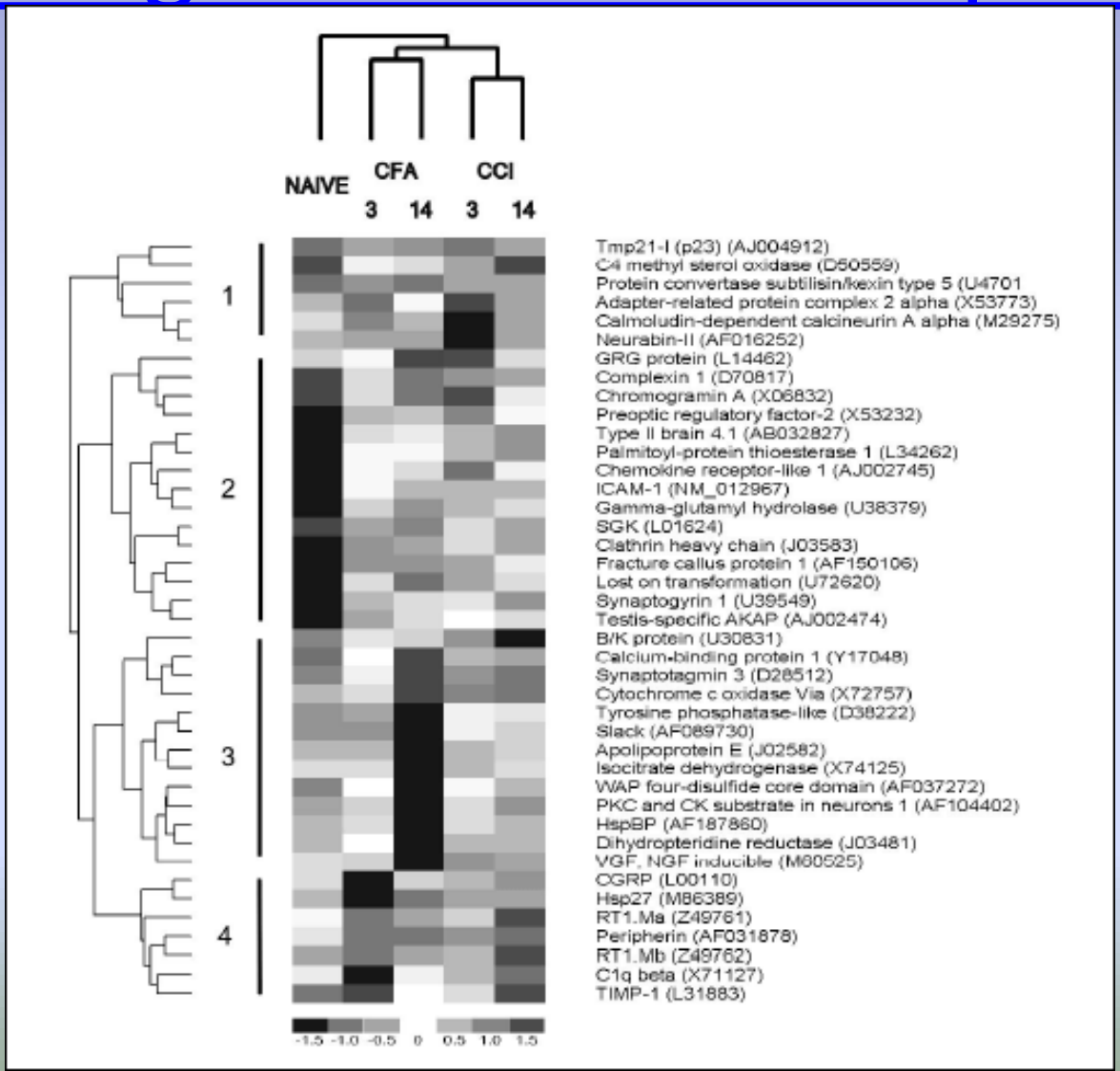
What's new?

Peripheral and central interaction: The 'neuromatrix'



What's new?

The genetic basis of V pain



Candidate genes so far

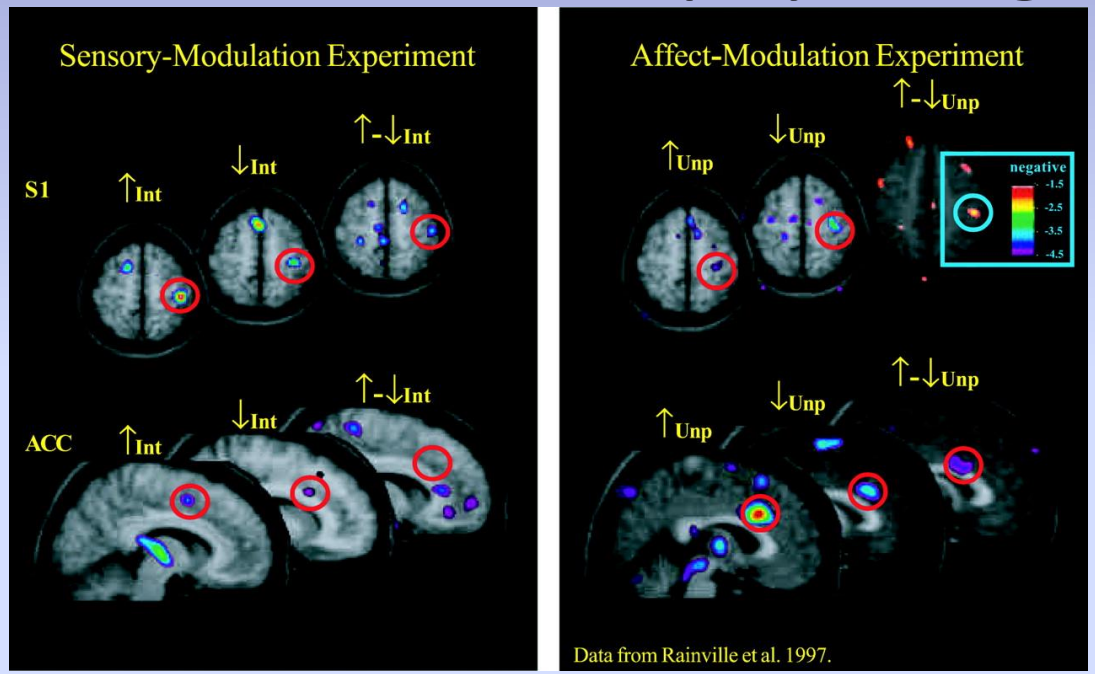
- **COMT** (Seeman et al., 2005; Diatchenko et al., 2004)
- **DRD4** (Benjamin et al., 1996, Ebstein et al., 1996)
- **GCH1** (Tegeder et al., 2006)
- **CYP2 D6** (DeLeon et al., 2003; Ammon-Treiber et al., 2003)
- **DAT1** (Mill et al., 2006)
- **OPRM** (Fillingim et al., 2005, Kim et al. 2004)
- **TRPV1** (Kim et al. 2006)
- **IL1** (Solovieva et al., 2004)
- **IL6** (Noponen-Hielta et al., 2005)
- **SCN9A** (Cox et al., 2006)

TNI

What's new?

Brain activity

affective vs neurophysiological



>90% affective

<10% sensory

Cortical Representation of the Sensory Dimension of Pain AJP - JN Physiol **July 1, 2001** vol. 86 no. 1 **402-411**

Ethan Kross [et] al., Proceedings National Academy of Science USA. Social rejection shares somatosensory representations with physical pain

What's new?

TNI

Structural Brain Changes:
Cause or Consequence of Chronic Pain?

Reorganisation

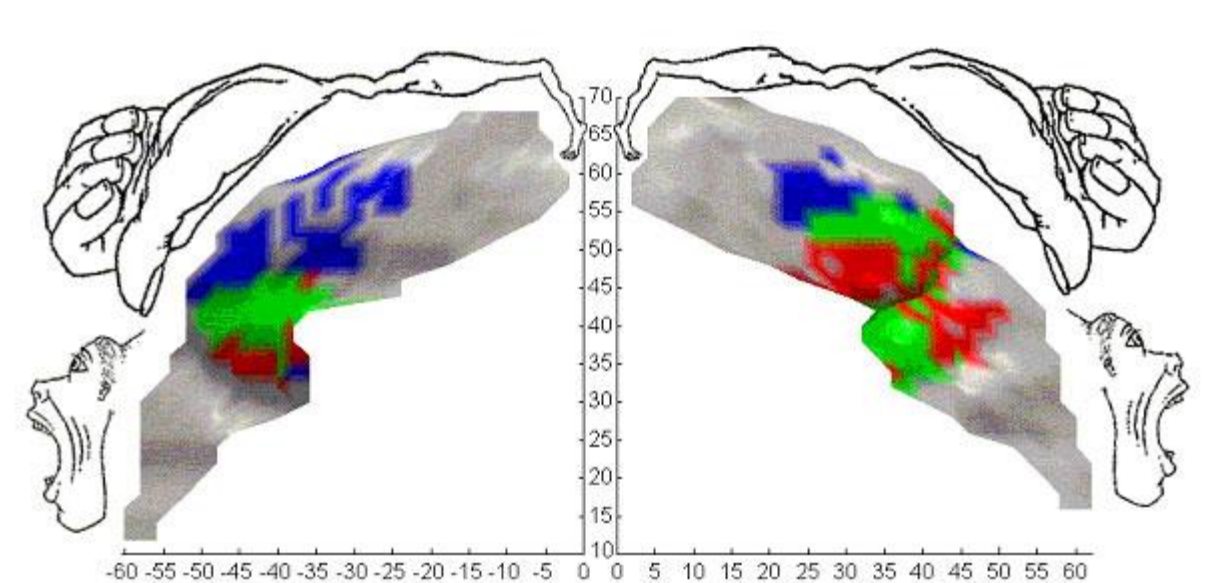
Loss of Gray matter

- Numerous modulatory mechanisms have been postulated and altogether addressed as "neuronal plasticity" (Woolf and Salter 2000), and structural changes of the brain need to be added to this list (Ma 2008)
- Gray matter changes The key message of all three studies is that the main difference in the brain structure between pain patients and controls may recede when the pain is cured
- The impact of pain killers and other medications on morphometric findings is simply not known.
- Chronic nociceptive input leads to intra cortical remodelling
- We need to improve our understanding of experience-dependent changes in cortical plasticity as this will have vast clinical implications for the treatment of chronic pain.

What's new?
Cortical reorganisation

A recent study suggests that brain changes in amputees may be pain-induced, questioning maladaptive plasticity as a neural basis of phantom pain. These findings add valuable information on cortical reorganization after amputation.

Flor H, Diers M, Andoh J **The neural basis of phantom limb pain.** Trends Cogn Sci. 2013 Apr 19. pii: S1364-6613(13)00080-6. doi: 10.1016/j.tics.2013.04.007. [Epub ahead of print]



TNI

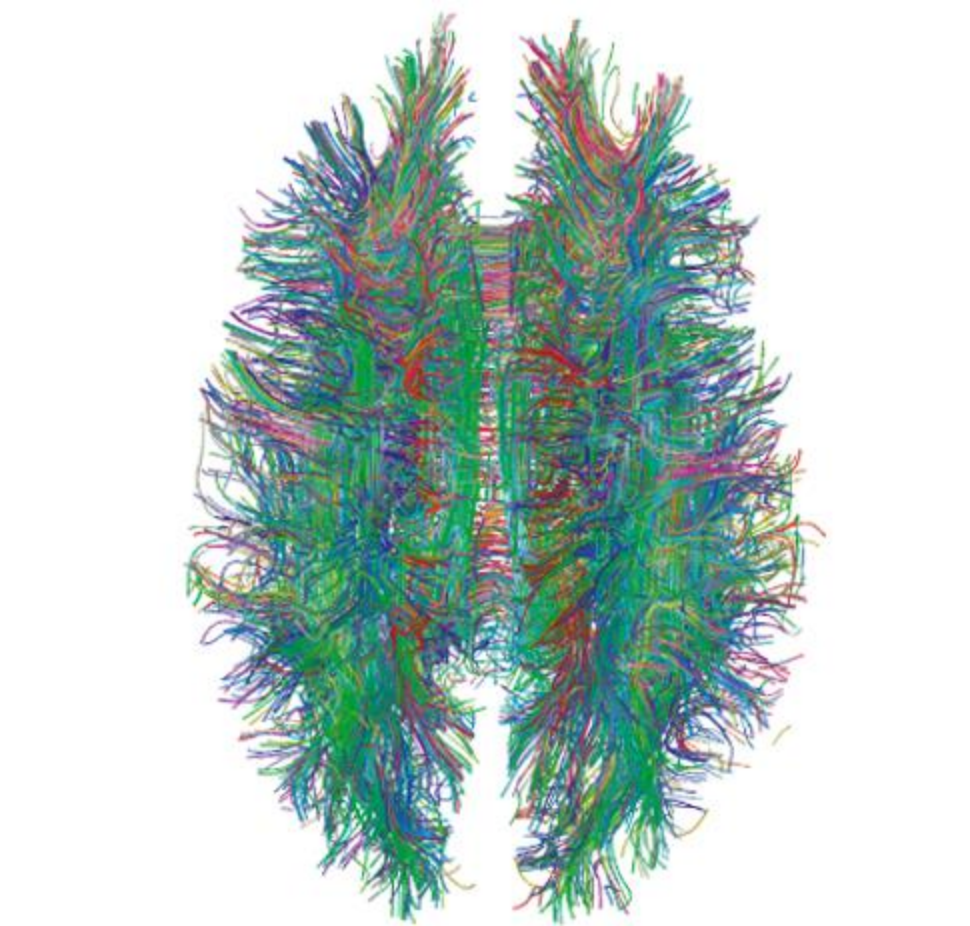
What's new?
Maladaptive plasticity, memory for pain

Flor H. **Maladaptive plasticity, memory for pain and phantom limb pain: review and suggestions for new therapies.** Expert Rev Neurother. 2008 May;8(5):809-18.

- Phantom limb pain is associated with plastic changes along the neuraxis
- Changes in the cortical representation of the affected limb
- Mechanisms underlying these maladaptive plastic changes are related **to a loss of GABAergic inhibition, glutamate-mediated long-term potentiation-like changes** and structural alterations such **as axonal sprouting**
- Behavioral interventions, stimulation, feedback and pharmacological interventions that are designed to reverse these maladaptive memory traces

What's new? Tractography

TNI



White_Matter_Connections_Obtained_with_MRI_Tractography.png Diffuser tension imaging DTi

TNI

What's new?
Loss gray matter

- It is indeed remarkable that the alterations (i.e., decrease in gray matter) seen in the ACC in migraine patients are similar to a decrease in this region in tension-type headache (Schmidt-Wilcke et al., 2005), posttraumatic headache (Obermann et al., 2009), idiopathic facial pain (Schmidt-Wilcke et al., 2010), chronic back pain (Schmidt-Wilcke et al 2006), and chronic phantom pain (Draganski, Moseret al 2006).

- **Gray matter** volume reduction reflects **chronic pain** in trigeminal neuralgia.Obermann M, Rodriguez-Raecke R, Naegel S, Holle D, Mueller D, Yoon MS, Theysohn N, Blex S, Diener HC, Katsarava Z
- Structural Brain Anomalies and **Chronic Pain**: A Quantitative Meta-Analysis of **Gray Matter** Volume. Smallwood RF, Laird AR, Ramage AE, Parkinson AL, Lewis J, Clauw DJ, Williams DA, Schmidt-Wilcke T, Farrell MJ, Eickhoff SB, Robin DA. J **Pain**. 2013 May 16.

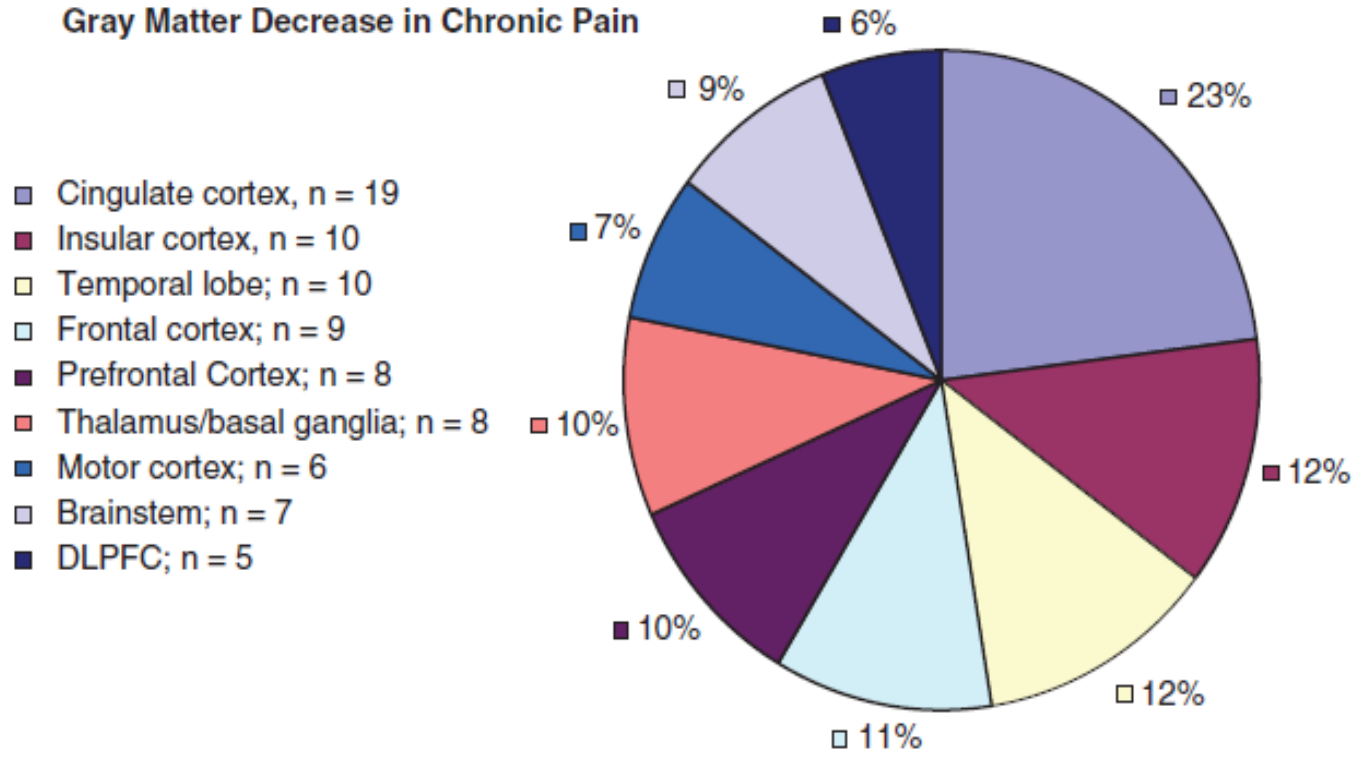


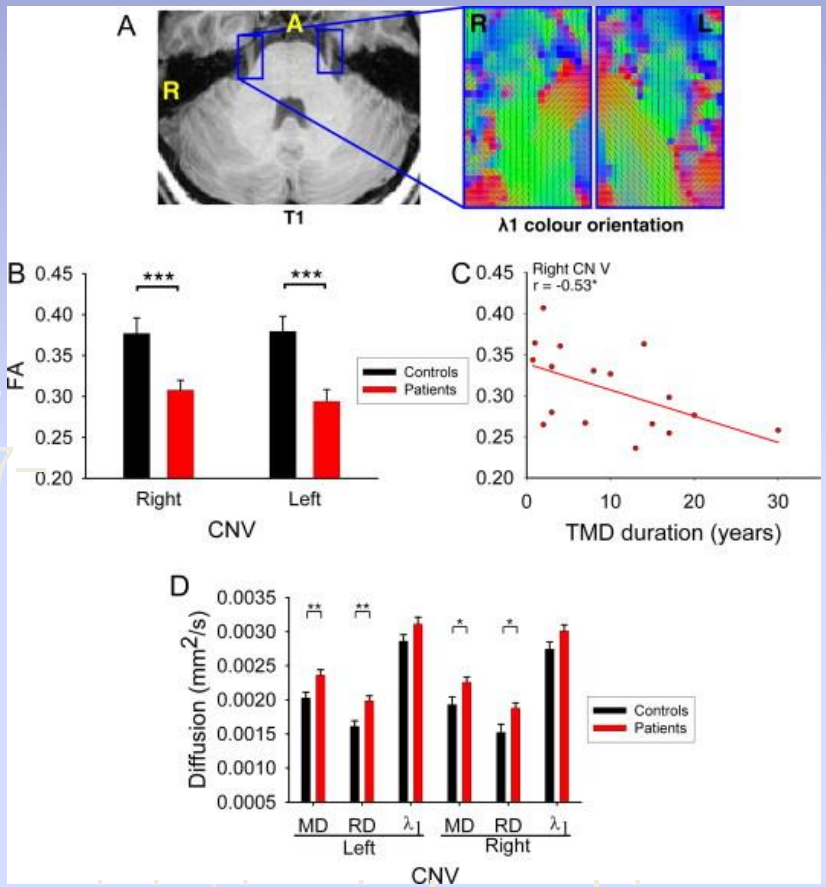
Figure 3. Gray matter decrease in 30 studies including a total of 839 patients. Compared with controls, 30 areas in the brain have been identified (increase and decrease of gray matter). Most areas are only cited by one or two studies. Only the brain areas being cited by at least five independent manuscripts are displayed (n corresponds to number of studies citing this brain area), and the percentages correspond to these nine structures. The most prominent findings are decreases in the cingulate cortex, the insular cortex, the temporal lobe, the frontal cortex, and the prefrontal cortex. DLPFC = dorsolateral prefrontal cortex.

What's new?
Trigeminal nerve

- Reduction gray + white matter TMD

White matter brain and trigeminal nerve abnormalities in temporomandibular disorder. Massieh Moayedi. PAIN Vol 153,7,2012,1467–1477

- Gray matter reduction in TN



Gray matter volume reduction reflects chronic pain in trigeminal neuralgia. Obermann M, Rodriguez-Raecke R, Naegel S, Holle D, Mueller D, Yoon MS, Theysohn N, Blex S, Diener HC, Katsarava Z.Neuroimage. 2013 Jul 1;74:352-8. doi: 10.1016

TNI

What's new?
Neurostimulation Advances

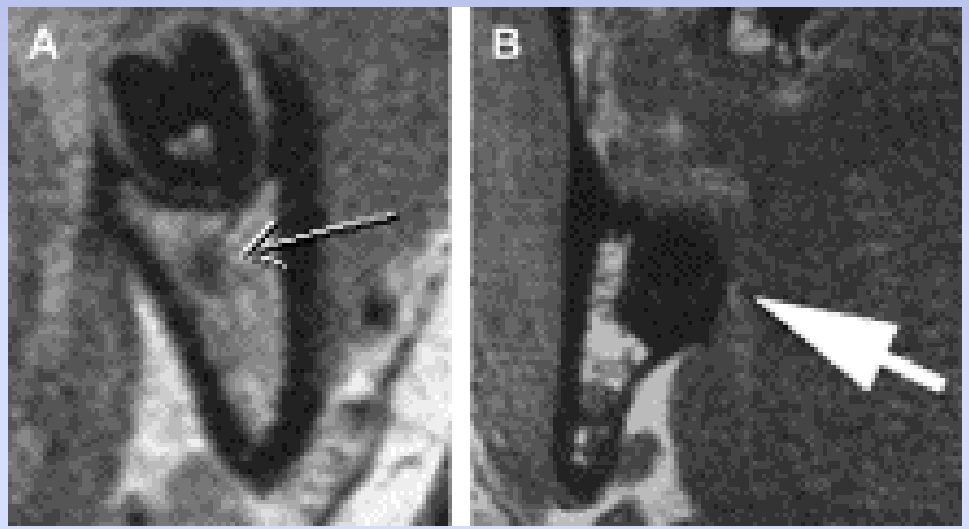
- Frequency
- Indwelling electrodes
- External remote control

- Sites
  - Sphenopalatine ganglion
  - Trigeminal sensory roots

TNI

What's new?

High-Resolution Magnetic Resonance Imaging inferior alveolar lingual nerve



- An update on pain
- An update on classification of pain
- Perioperative techniques to minimise pain
- Managing and preventing post operative pain
- **Whats new?**
  - **Surgical methods**

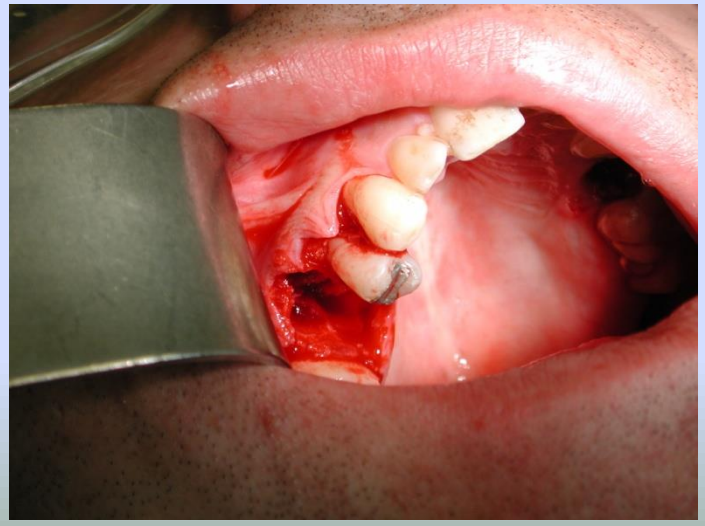
Modified Surgery no brainer-
minimise soft and hard tissue damage

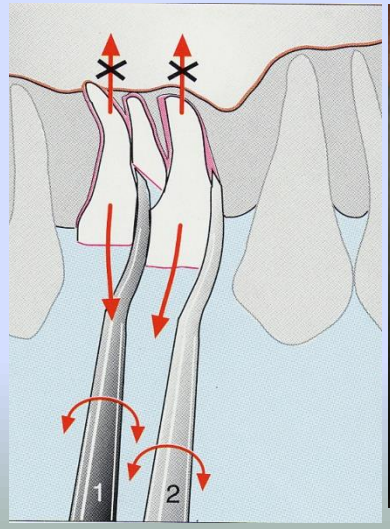
TNI

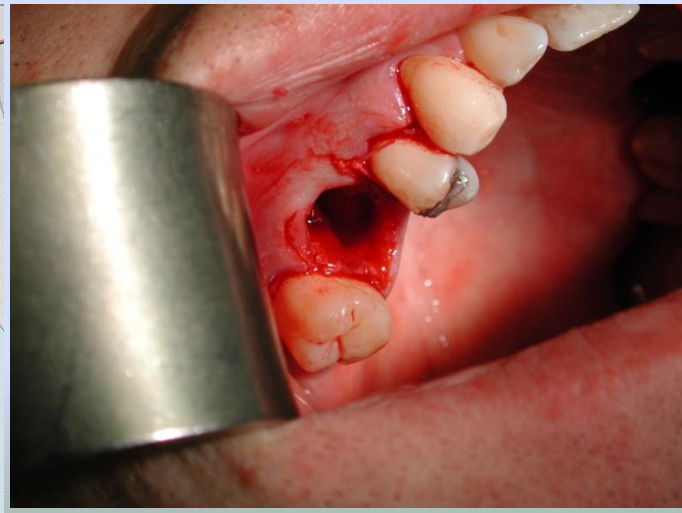
OLD

NEW

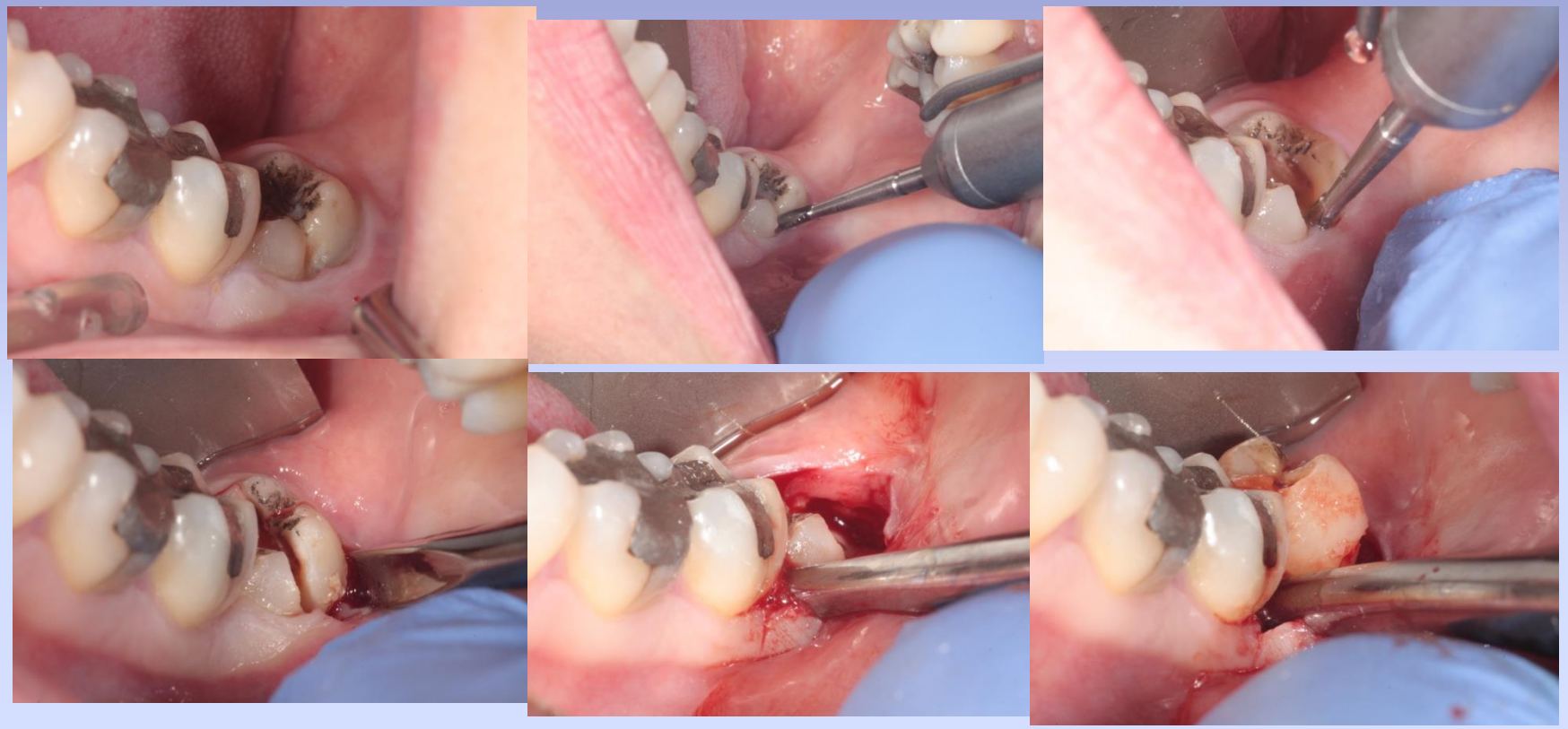
Division of fractured roots



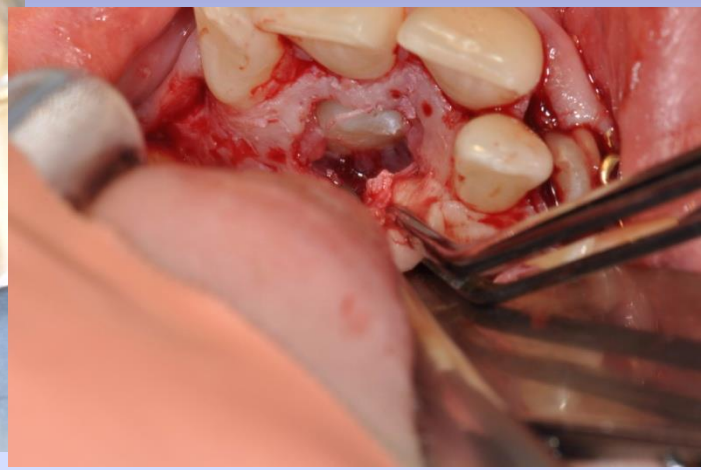


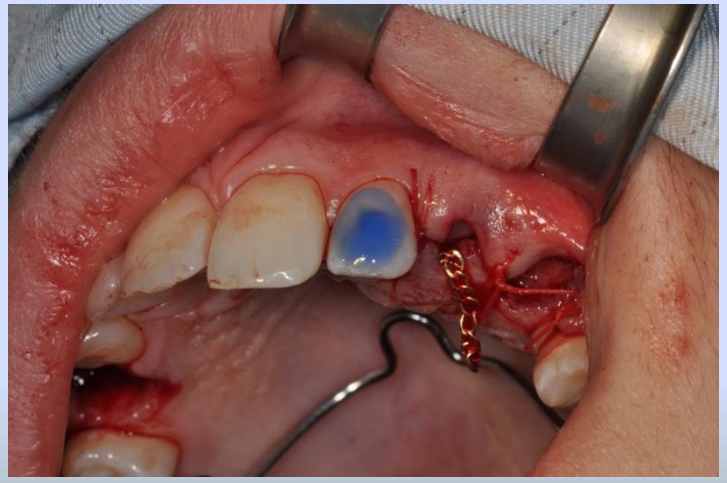


Tooth Section



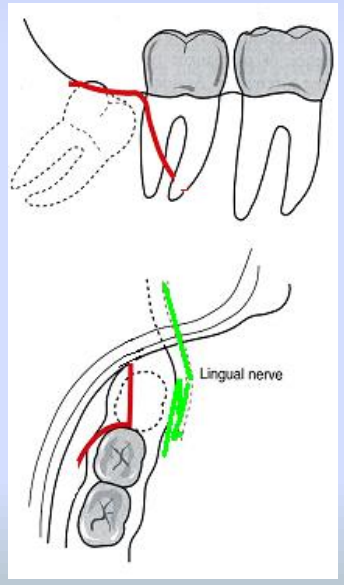
Canine surgery

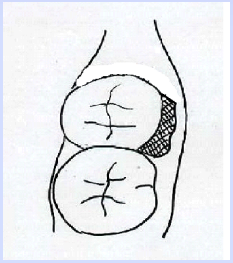


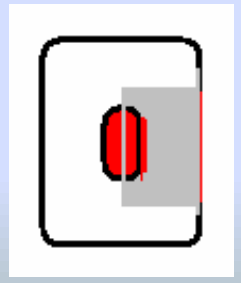


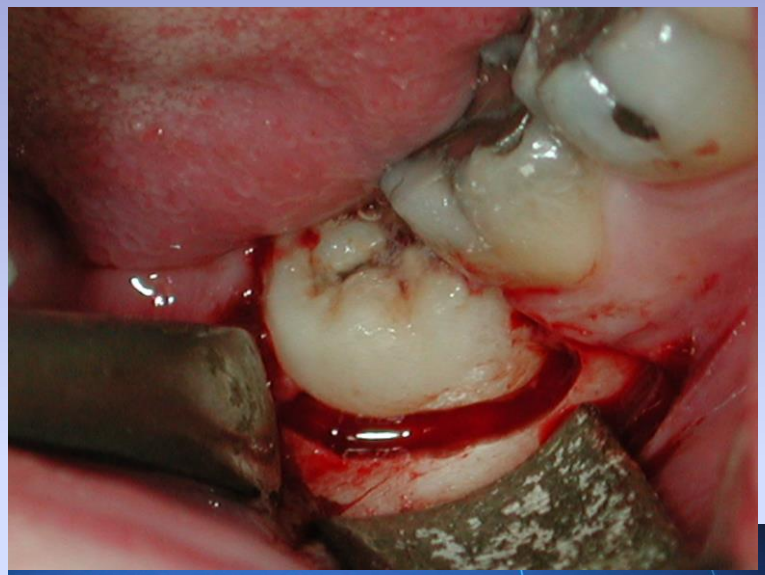
Minimal access

TNI









Evaluation of trigeminal nerve injuries in relation to third molar surgery in a prospective patient cohort. Recommendations for prevention. **Renton T**, Yilmaz Z, Gaballah K. Int J Oral Maxillofac Surg. 2013 Dec;41(12):1500-18

Lingual split..the old

TNI

Buccal technique the new

TNI

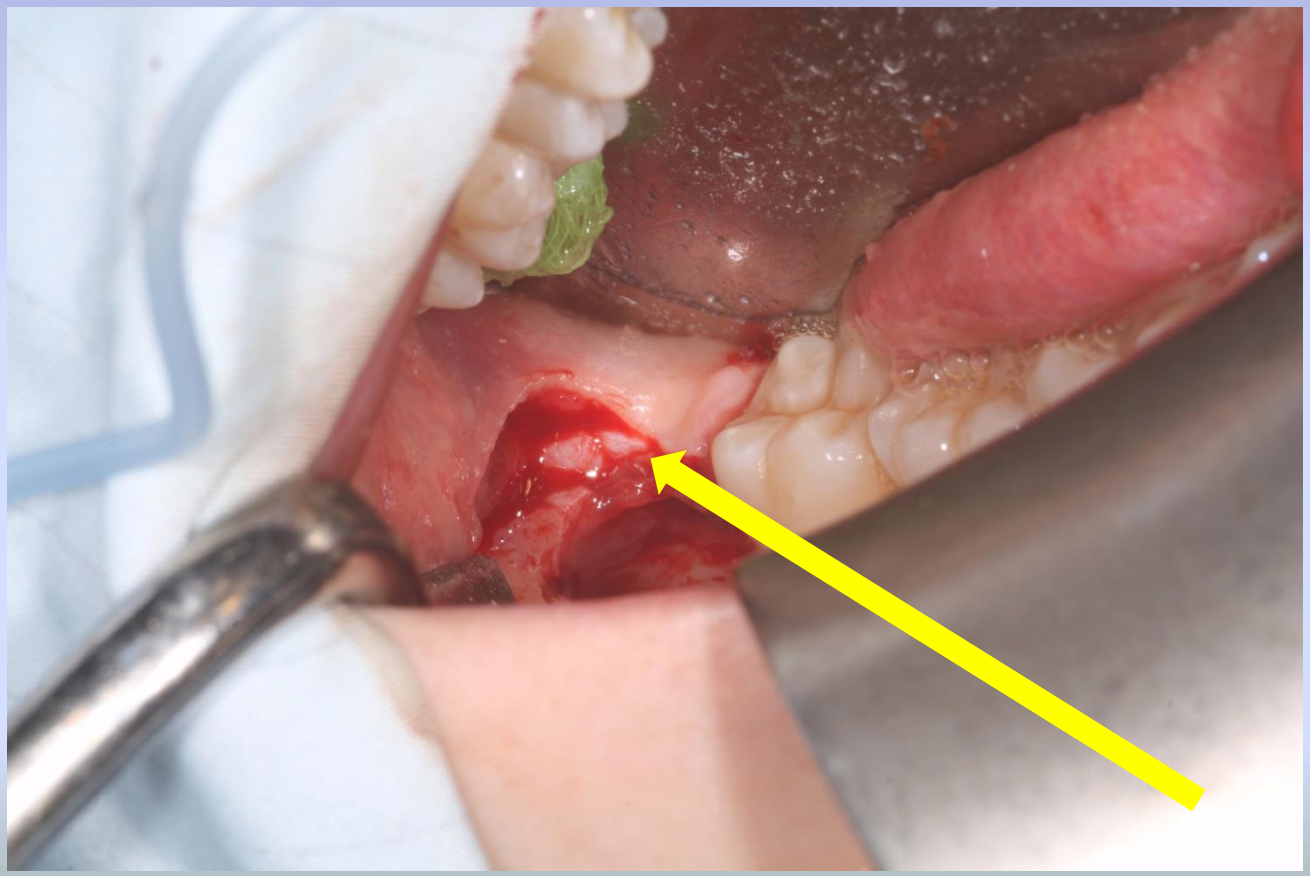
Buccal technique..for all

TNI

Prevention of lingual nerve injury in

TNI

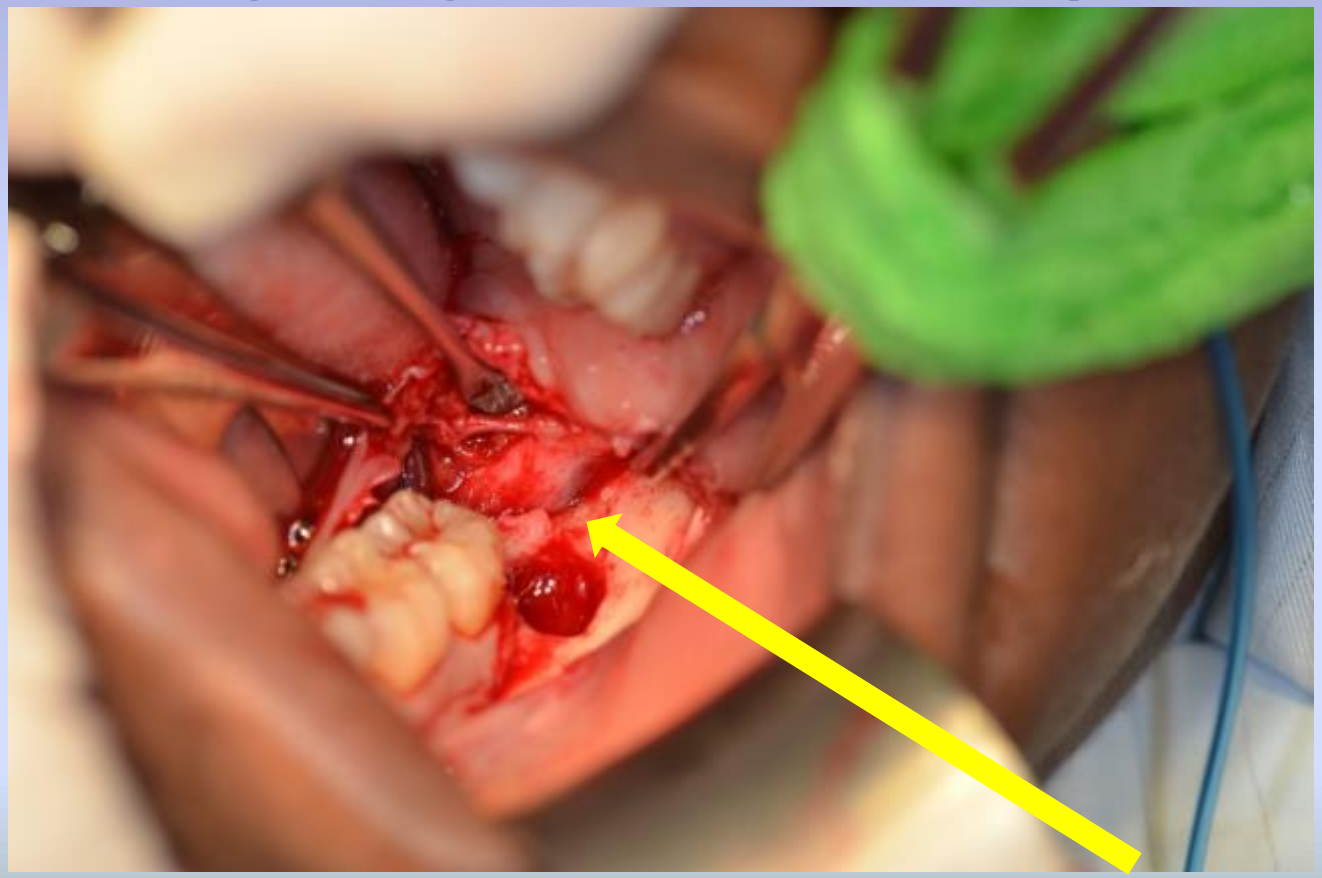
Spot the lingual nerve!



Prevention of lingual nerve injury in

TNI

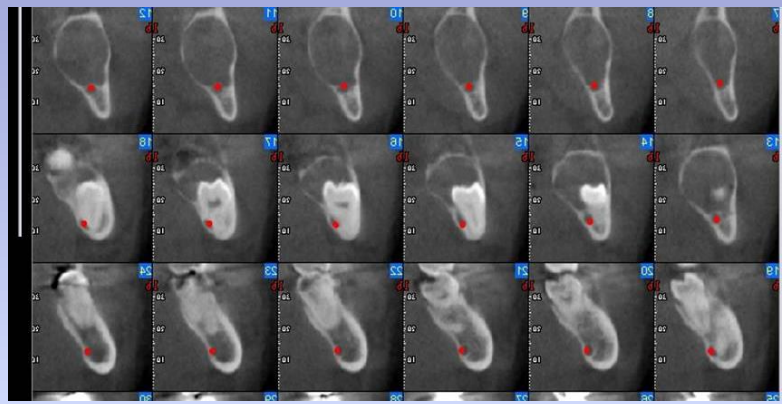
During lingual nerve exploration



Tailor your surgery minimise harm!

TNI

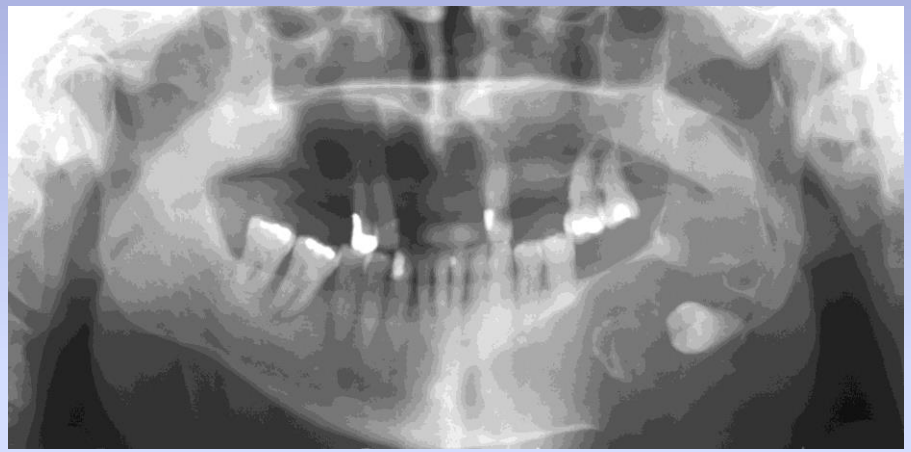
Coronectomy

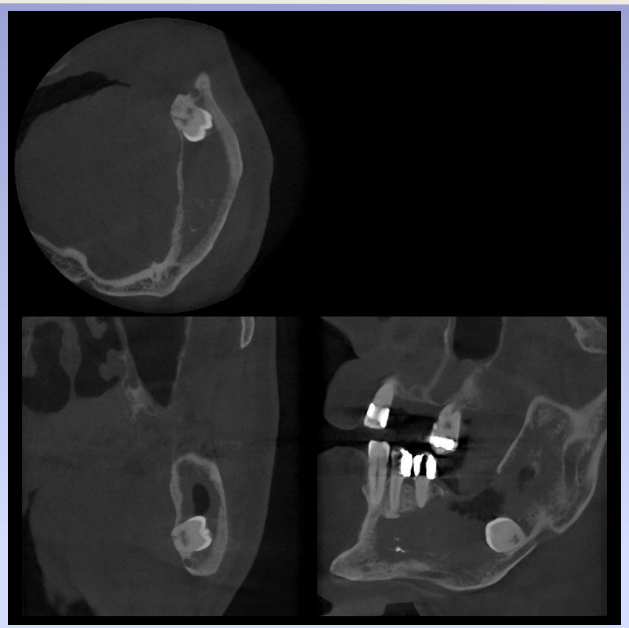


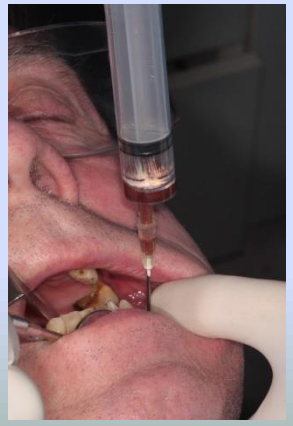
Prevention of nerve injury

TNI

Tailored treatment

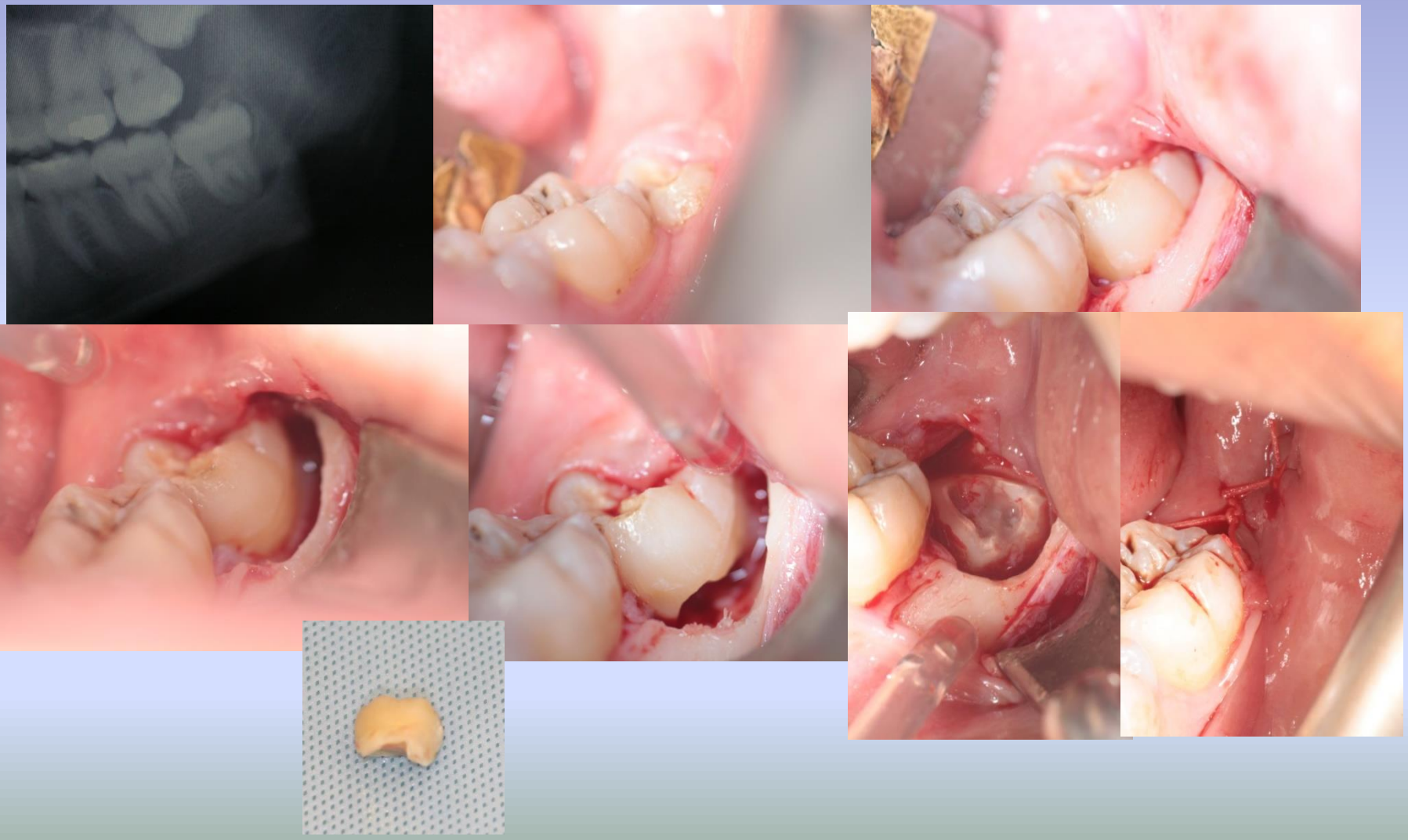






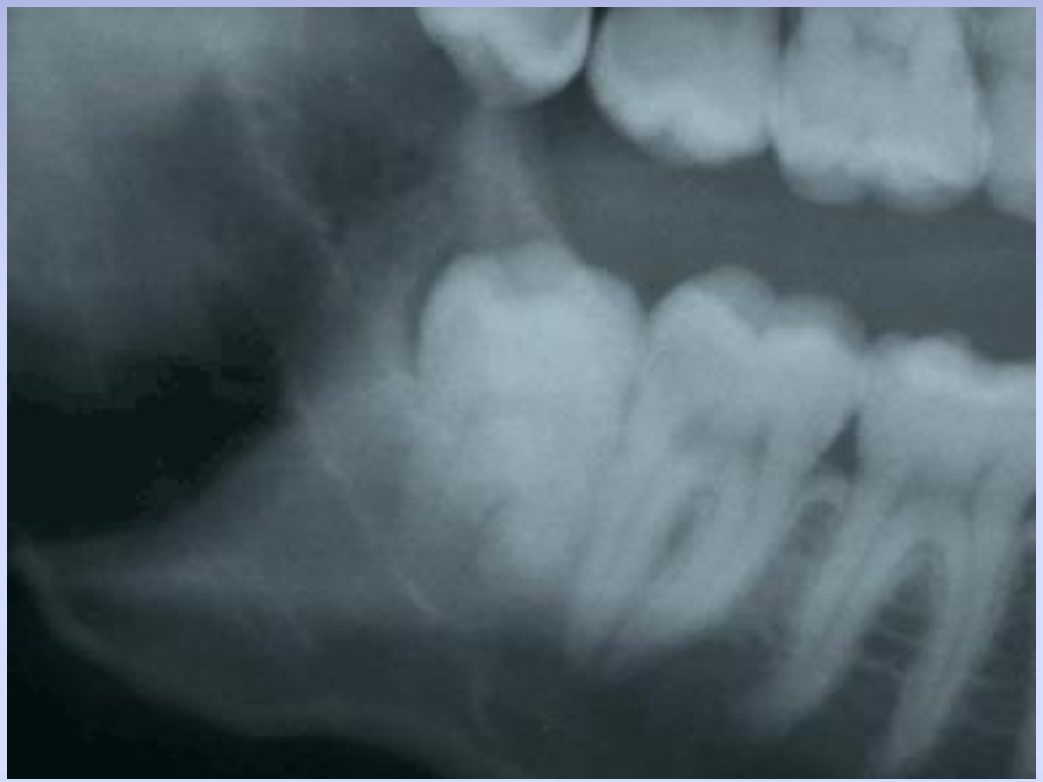
Prevention of IAN injury

TNI



Prevention of IAN injury

TNI



Simple recommendation for OS pain management

TNI

- Homecheck
  - telephone call 24 hours after surgery by the surgeon
- Instruct patient to start to take ibuprofen with paracetamol as soon a LA is wearing off
  (3.5 hours post surgery)
- Take analgesics
  - Ibuprofen (max 600mg) + 1g Paracetamol
  - 4 hourly first day (2pm-6pm 10pm)

- **Less than 50% of my patients need any Pain relief the day after surgery!!!!!**

Summary

TNI

- Understanding of pain and recent developments
- Strategy for managing /preventing pain in OS
  - Preoperative
    - Care compassion consent competency clear
    - Analgesics/ steroids?
  - Intra operative methods to minimise pain and morbidity
    - LA
    - Minimal access Surgical methods
    - Analgesics / steroids?
  - Post surgical
    - Good instructions expectancies
    - Appropriate analgesic regime……no codeine
    - Home check

Remember

TNI

- If there is NO response to anti inflammatory drugs
- Consider neuropathic pain

Baffled?????

TNI

- Does the patient reaction seem disproportionate to the cause?
- Consider
  - Potential nerve injury
  - Psychometrics……..
    - Liaison Psychiatry
    - Clinical psychology

Suggested analgesic regimes for acute trigeminal pain.

	Recommended	Alternative
Mild pain <3 (e.g. routine restorative dental work, routine extraction, routine endodontic treatment, scaling)	Ibuprofen 200/400mg TDS With paracetamol 1g QDS then PRN	Paracetamol 1g QDS reduce to PRN
Moderate pain >3 (e.g. surgical dental extractions, implant surgery,	Ibuprofen 400/600mg TDS + paracetamol 1g QDS PRN	Paracetamol 1g QDS + codeine 30mg QDS
Severe pain >7 (e.g. osteotomies, open reduction internal fixation of jaws, autologous bone graft) Rescue medication Tramadol?	Ibuprofen 400/600mg QDS + paracetamol 1g QDS + codeine 30mg Diclofenac 25/50mg TDS + paracetamol 1g QDS + codeine 30mg QDS reduce to ibuprofen 400mg + paracetamol 1g QDS reduce to paracetamol 1g QDS with ibuprofen PRN	Paracetamol 1g QDS + codeine 60mg QDS Tramadol
Abbreviations: TDS, 3 times/day; QDS, 4 times/day; PRN, as needed		

Suggested analgesic regimes for acute trigeminal pain.

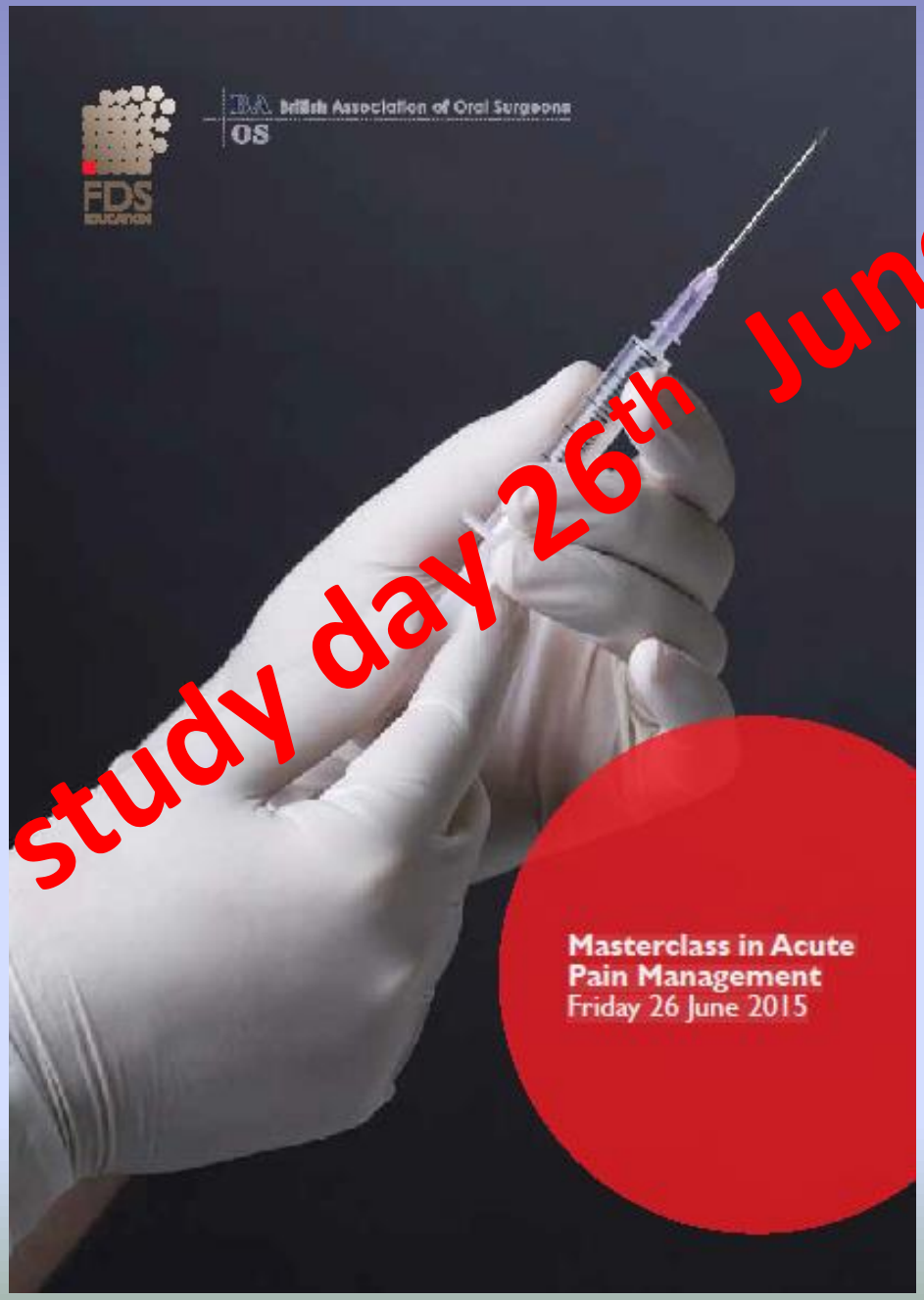
	Recommended	Alternative
Mild pain <3 (e.g. routine restorative dental work, routine extraction, routine endodontic treatment, scaling)	Ibuprofen 200/400mg TDS With paracetamol 1g QDS then PRN	Paracetamol 1g QDS reduce to PRN
Moderate pain >3 (e.g. surgical dental extractions, implant surgery,	Ibuprofen 400/600mg TDS + paracetamol 1g QDS PRN	Paracetamol 1g QDS + codeine 30mg QDS
Severe pain >7 (e.g. osteotomies, open reduction internal fixation of jaws, autologous bone graft) **Rescue medication** **Tramadol?** **Or Tapentadol**	Ibuprofen 200/400mg QDS + paracetamol 1g QDS + codeine 30mg Diclofenac 25/50mg TDS + paracetamol 1g QDS + codeine 30mg QDS reduce to ibuprofen 400mg + paracetamol 1g QDS reduce to paracetamol 1g QDS with ibuprofen PRN	Paracetamol 1g QDS + codeine 60mg QDS Reduce to paracetamol 1g QDS then PRN
Abbreviations: TDS, 3 times/day; QDS, 4 times/day; PRN, as needed		

No Codeine !!!!!

Launching June 2015

Orofacialpain.org.uk

RCS study day 26th June 2015



Remember in order to manage your patient's expectations you need to know your patient!

Thank you

Trigeminalnerve.org.uk

Problems with oral analgesics

TNI

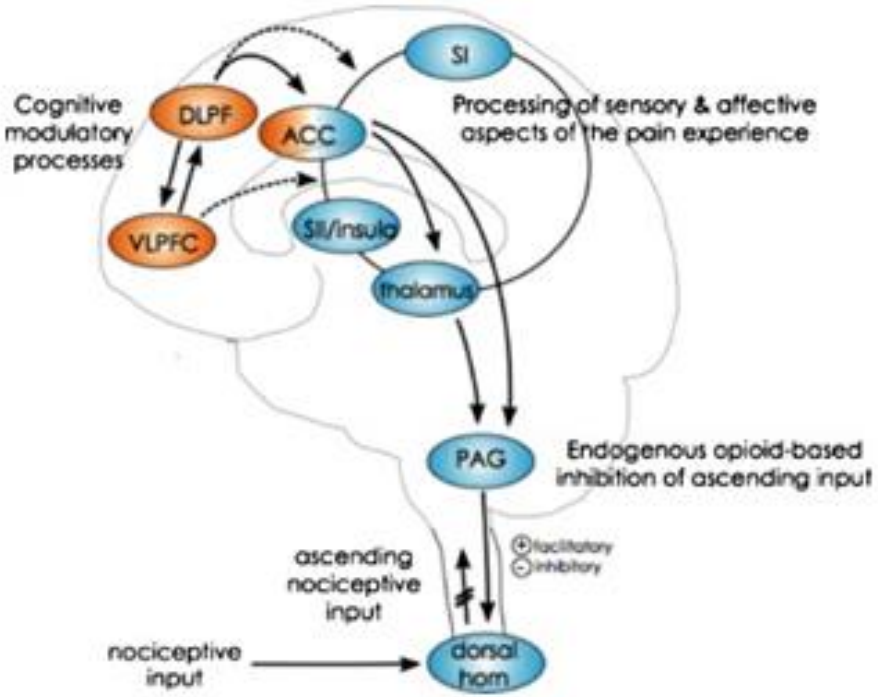
- NSAIDs
  - allergy to aspirin
  - history of asthma
  - under 12 years - Reyes syndrome
  - history peptic ulceration or GI bleeding
    - DU 3-4 % PU 4-7% (risk factors >75yr/history PU or GI bleed and heart disease/ + H pylori 27%)
  - bleeding disorders -reduced platelet adhesion
  - pregnancy / breast feeding
  - renal impairment
  - Decreases effectiveness of anti-hypertensives
- Paracetamol
  - no inflammatory action
    - side effects are rare
    - Decreases liver function (CI AZT therapy)
    - irreversible hepatic impairment 10-15g within 24 hours **(ONLY 20-30 tablets)**
    - renal impairment
- Opioids
    - respiratory depression
    - constipation
    - overdose
    - Dependency
    - Pethidine can cause convulsions with repeated doses

Deaths associated OTC analgesics (pts/year)

TNI

		UK	USA	Canada
• Opiates				
–	Addiction	30,000		
–	Death	100		
• NSAIDs				
–	Prescription	20m	70m	10m
–	Death	150	7,600	365
–	Admissions	12-35K	76K	39K
• Paracetamol				
–	Death		600	

– Responsible for 1 in 10 liver transplant patients



Possible neural pathways of cognitive **pain modulation**. Cognitive modulations of pain are related to activation of prefrontal brain areas such as the dorsolateral prefrontal cortex (DLPFC), ventrolateral prefrontal cortex (VLPFC), and to the anterior cingulate cortex (ACC); shown in orange. These regions may modulate activation in afferent pain regions in the cortex (ACC, primary- and secondary somatosensory cortex, insula and thalamus), as well as the periaqueductal gray (PAG) and dorsal horns of the spinal cord; shown in blue. The DLPFC and VLPFC are connected to the ACC, which, in turn, projects to thalamus and the PAG, a core component of the descending pain modulatory system.

Research

British Dental Journal **197**, 407 - 411 (2004)
Published online: 9 October 2004 | doi:10.1038/sj.bdj.4811721

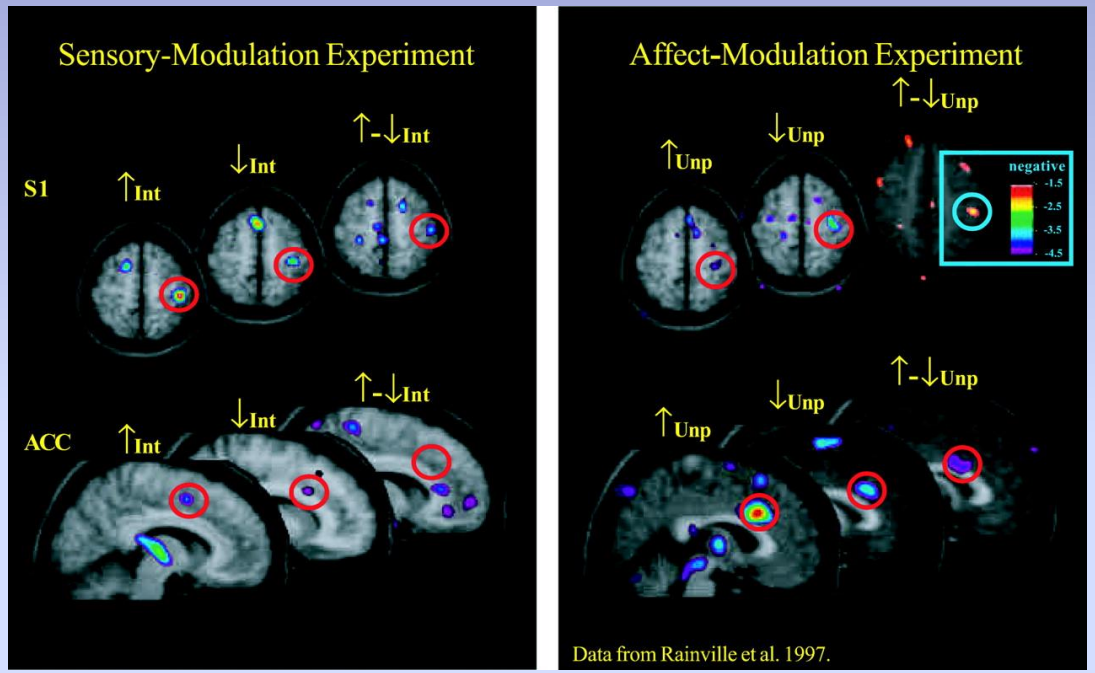
Subject Category: Anaesthesia and sedation

Relative efficacy of oral analgesics after third molar extraction

J Barden[1], J E Edwards[2], H J McQuay[3], P J Wiffen[4] & R A Moore[5]

- This paper reviews the available high quality information on analgesics commonly prescribed by dentists, including COX-2 selective inhibitors.
- Problems related to chance effects are avoided by combining multiple trials in a meta-analysis.
- There is good evidence of efficacy for most commonly-prescribed analgesics

Brain activity
affective vs neurophysiological



>90% affective
<10% sensory

Cortical Representation of the Sensory Dimension of Pain AJP - JN Physiol **July 1, 2001** vol. 86 no. 1 **402-411**

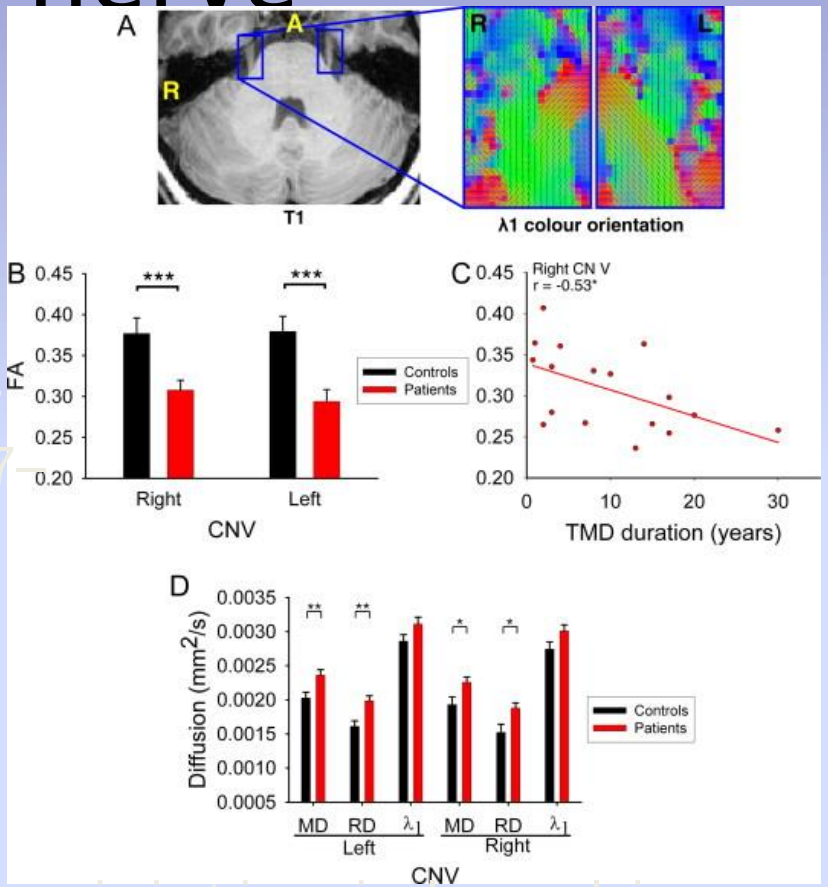
Ethan Kross [et] al., Proceedings National Academy of Science USA. Social rejection shares somatosensory representations with physical pain

Trigeminal nerve

- Reduction gray + white matter TMD

White matter brain and trigeminal nerve abnormalities in temporomandibular disorder. Massieh Moayedi. PAIN Vol 153,7,2012,1467–1477

- Gray matter reduction in TN

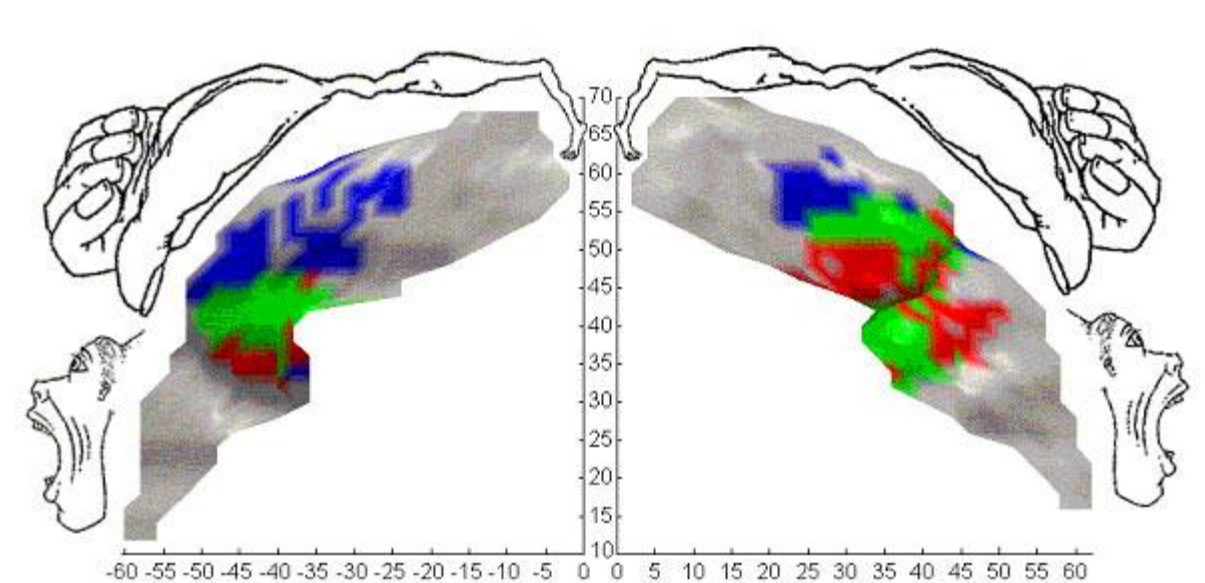


Gray matter volume reduction reflects chronic pain in trigeminal neuralgia. Obermann M, Rodriguez-Raecke R, Naegel S, Holle D, Mueller D, Yoon MS, Theysohn N, Blex S, Diener HC, Katsarava Z.Neuroimage. 2013 Jul 1;74:352-8. doi: 10.1016

Cortical reorganisation

A recent study suggests that brain changes in amputees may be pain-induced, questioning maladaptive plasticity as a neural basis of phantom pain. These findings add valuable information on cortical reorganization after amputation.

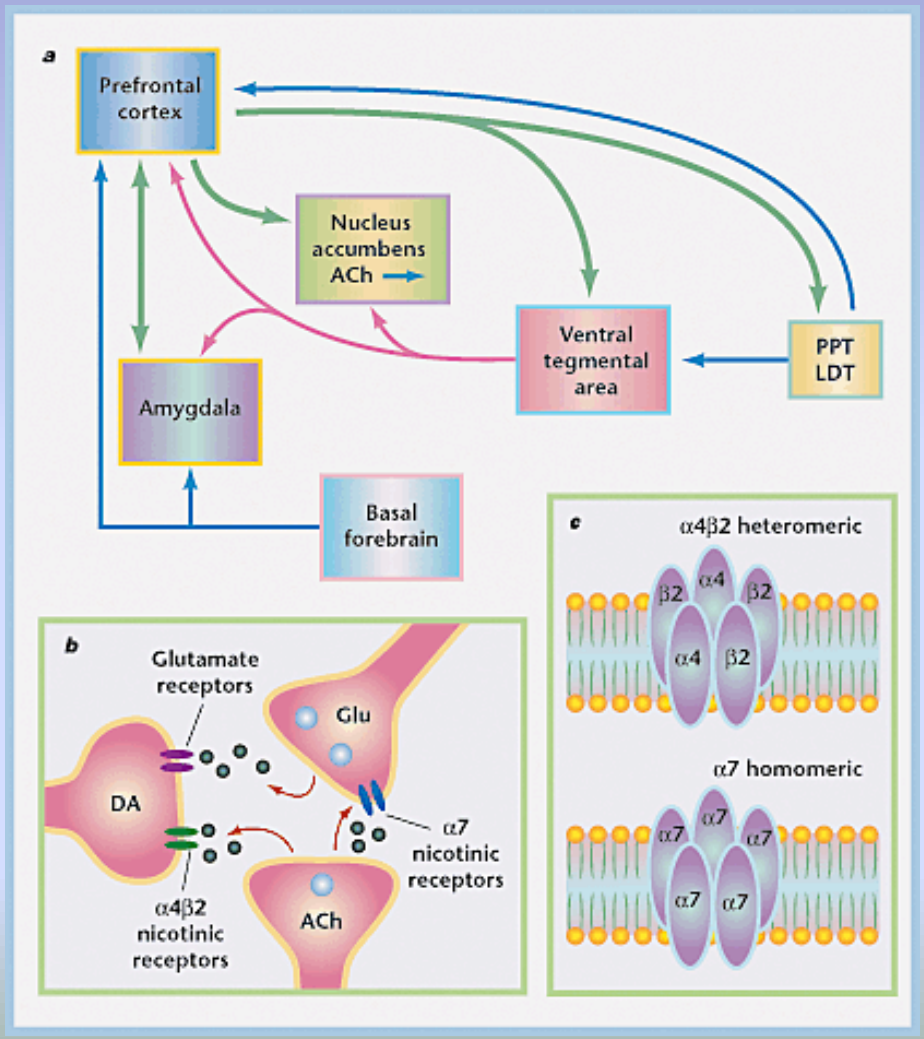
Flor H, Diers M, Andoh J **The neural basis of phantom limb pain.** Trends Cogn Sci. 2013 Apr 19. pii: S1364-6613(13)00080-6. doi: 10.1016/j.tics.2013.04.007. [Epub ahead of print]



Central Sensitization: A Generator of Pain Hypersensitivity by Central Neural Plasticity

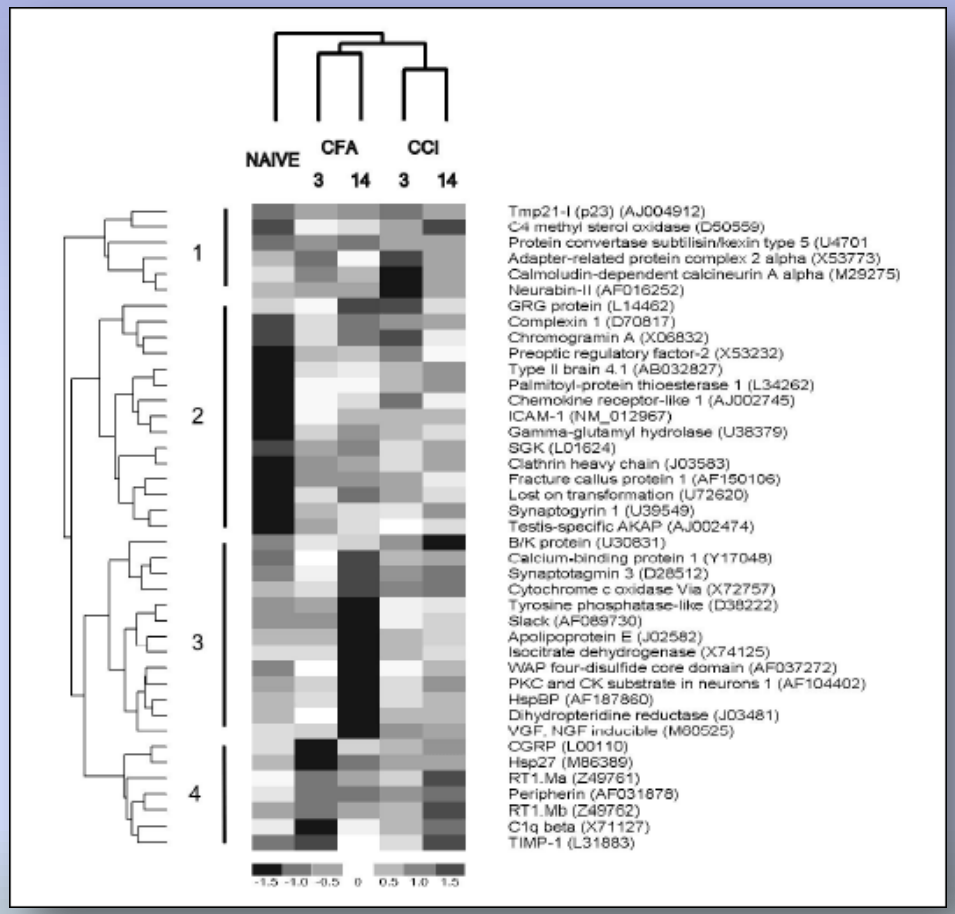
- Facilitation
- Augmentation
- Potentiation
- Amplification

=hypersensitivity



Alban Latremoliere& Clifford J. WoolfCentral Sensitization: A Generator of Pain Hypersensitivity by Central Neural Plasticity.
The Journal of Pain Volume 10, Issue 9 , Pages 895-926, September 2009

Genetics to blame?



Research

British Dental Journal **197**, 407 - 411 (2004)
Published online: 9 October 2004 | doi:10.1038/sj.bdj.4811721

Subject Category: Anaesthesia and sedation

Relative efficacy of oral analgesics after third molar extraction

J Barden[1], J E Edwards[2], H J McQuay[3], P J Wiffen[4] & R A Moore[5]

- This paper reviews the available high quality information on analgesics commonly prescribed by dentists, including COX-2 selective inhibitors.
- Problems related to chance effects are avoided by combining multiple trials in a meta-analysis.
- There is good evidence of efficacy for most commonly-prescribed analgesics

Intervention Protocol

Protective analgesia for postoperative pain following third molar surgery

Sin Leong Yong[1,*], Tanya Walsh[2], Paul Coulthard[1]

Database Title
The Cochrane Library

Editorial Group: Cochrane Oral Health Group

Published Online: 8 SEP 2010

DOI: 10.1002/14651858.CD008692

Am score

Additional Information **(Show All)**

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2 The University of Manchester, School of Dentistry, Manchester, UK

*Sin Leong Yong, Oral and Maxillofacial Surgery, School of Dentistry, The University of Manchester, Higher Cambridge Street, Manchester, M15 6FH, UK. sin.l.yong@manchester.ac.uk.

Abstract | Article | References | Cited By

PAIN® 153 (2012) 1364–1367

PAIN®

www.elsevier.com/locate/pain

Topical review

Evidence for analgesic effect in acute pain – 50 years on

Henry J. McQuay [a], Sheena Derry [a], Christopher Eccleston [b], Phillip J. Wiffen [c], R. Andrew Moore [a,*]

[a] Pain Research and Nuffield Division of Anaesthetics, University of Oxford, The Churchill, Oxford, UK
[b] Centre for Pain Research, The University of Bath, Bath BA2 7AY, UK
[c] The UK Cochrane Centre, NHS R&D Programme, Summertown Pavilion, Middle Way, Oxford OX2 7LG, UK

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

1. Introduction

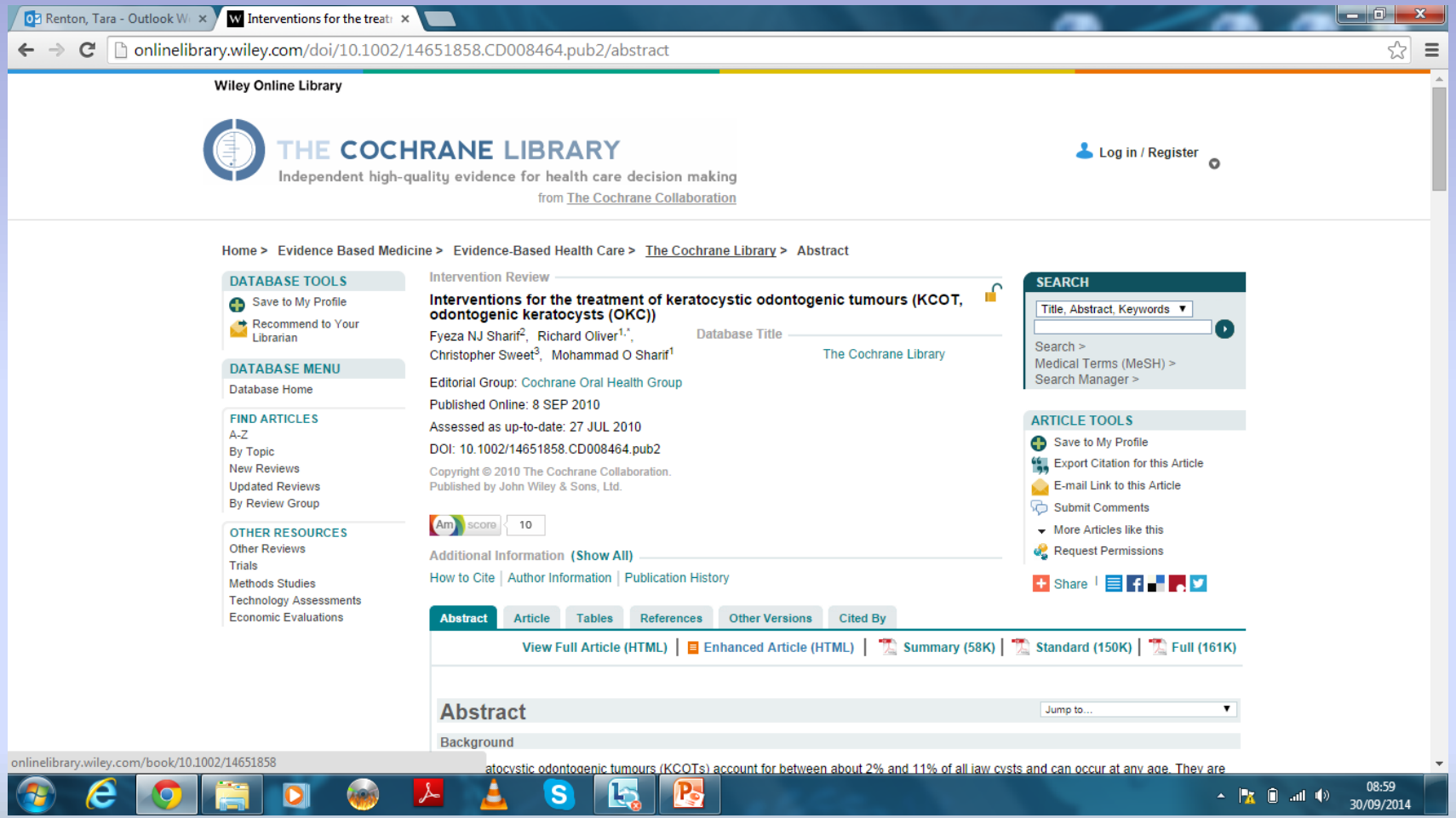
The basic design of studies to measure the analgesic effect of drugs in acute pain was worked out in the 1950s and 1960s, was rigorously tested at the time, and established randomisation and double blinding as essential standards for objective assessment of analgesic efficacy [7]. The design became the conventional way to establish analgesic efficacy, typically performed early in the development of new pain-relieving drugs. Several individual patient analyses have confirmed the validity of methods for evaluating efficacy [2,3,16,18,19], but not adverse events [6].

A recent change has been the way in which outcomes are handled. While the original use of average summed pain intensity difference or total pain relief over 4–6 hours has statistical value, emphasis is now placed on the individual patient's response, par-

2. The evidence

To the Cochrane overview [15] we have added results from non-Cochrane reviews on tramadol [18], tramadol plus paracetamol [5], and ibuprofen plus paracetamol [19], all using identical methods. Collectively they provide a wealth of information:

- Seven drugs had no useful trials, including meloxicam, nabumetone, nefopam, and sulindac.
- There was good evidence of no analgesic benefit for aspirin 500 mg, oxycodone 5 mg, and aceclofenac 150 mg.
- Twenty-five drug and dose combinations either had very limited data (fewer than 2 trials and 200 patients), or had more extensive data, but where small numbers of patients and/or small effect size combined to make the results sus-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Intervention Review
Interventions for the treatment of keratocystic odontogenic tumours (KCOT, odontogenic keratocysts (OKC))
Fyeza NJ Sharif[2], Richard Oliver[1,*], Christopher Sweet[3], Mohammad O Sharif[1]
Database Title
The Cochrane Library
Editorial Group: Cochrane Oral Health Group
Published Online: 8 SEP 2010
Assessed as up-to-date: 27 JUL 2010
DOI: 10.1002/14651858.CD008464.pub2
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Am score 10
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Abstract
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Background
atocystic odontogenic tumours (KCOTs) account for between about 2% and 11% of all jaw cysts and can occur at any age. They are
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Intervention Review

Dental extractions prior to radiotherapy to the jaws for reducing post-radiotherapy dental complications

Shiyana Eliyas[1,*], Ahmed Al-Khayatt[2], Richard WJ Porter[2], Peter Briggs[2]

Database Title
The Cochrane Library

Editorial Group: Cochrane Oral Health Group

Published Online: 28 FEB 2013

Assessed as up-to-date: 22 NOV 2012

DOI: 10.1002/14651858.CD008857.pub2

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