

Drugs and Swallowing

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Stroke Physician

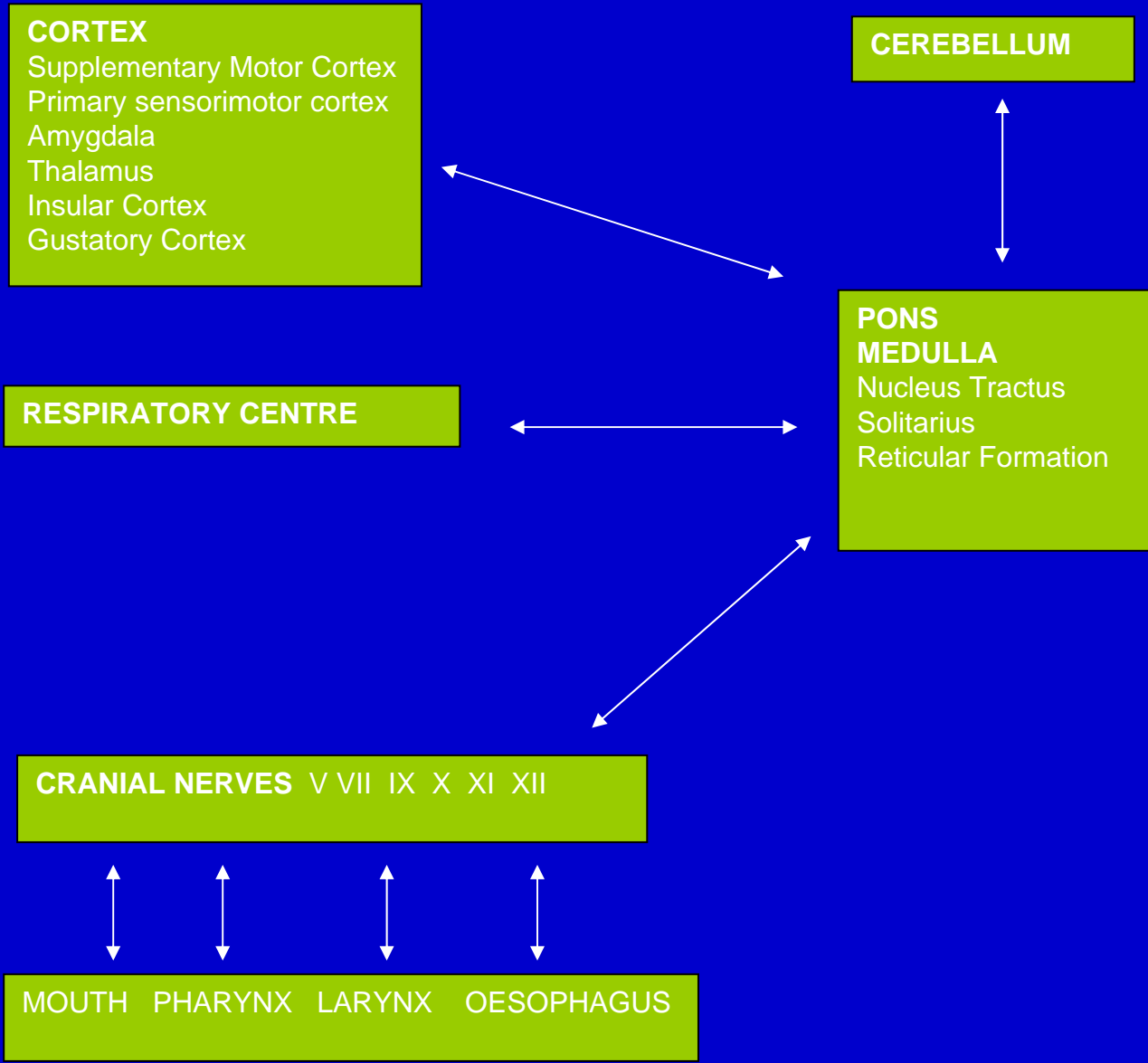
East Kent Hospitals

Neurology of Swallowing

- Complex
 - Cortical
 - Subcortical
 - Brainstem
 - Substantia nigra
 - Medulla
 - Pons
 - Interaction with other centres

Neurology of Swallowing

- Cranial Nerves
 - Feed back
- Transmitters
 - Amino acids
 - Acetylcholine
 - GABA
 - Peptides



Cortex
Amygdala
Insular Cortex
Sensorimotor Cortex
Motor Cortex

DA

Basal Ganglia /
Striatum

Ek

Globus
Pallidus

Sub Thalamic
Nucleus

+

SP
—

Substantia
Nigra

—

Thalamus

GABA

Glossopharyngeal Nerve
Superior Laryngeal Nerve
(Vagus)

Pons
Medulla
Reticular formation
Nucleus Ambiguus
Nucleus Tractus
Solitarius

Pharynx
Larynx

SP

Affect of Drugs on Swallowing

- Adverse / inhibitory
- Facilitatory

Adverse

- Local
- Side Effects
- Result of Therapeutic Action
- Idiosyncratic
- Central

Local Action

- Anticholinergics
- Local Anaesthetics
- Ipratropium
- Codeine
- Diuretics

Global Action

- Anti emetics
- Anti Epileptic Medication
- Benzodiazepines
- Muscle relaxants
- Opiates
- Neuroleptics

Complications of Therapeutic Actions

- Anti Neoplastic Agents
- Steroids

Idiosyncratic

- Sulphonamides

Lowering of Lower oesophageal Sphincter Pressure

- Dopamine
- Nitrates
- Calcium Channel Blockers
- Fat
- Chocolate
- Glucagon
- Progesterone
- Gut Hormones

Specific Central Action

- Anti Epileptic Medication
- Neuroleptics
- Benzodiazepines
- Opiates
- Anticholinergics
- Reserpine

Facilitatory

Central Action

- L-Dopa
- Angiotensin Converting Enzyme Inhibitors
- Amantadine
- Calcium Channel Blockers

Central Action

- Animal Studies
 - Amphetamine
 - Serotonin agonists

Local Action

- Capsaicin
- Citric Acid
- Cysateamine
- Botulinum Toxin

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Basal Ganglia Stroke

- Stroke patients
- No infarct/ Basal Ganglia/ Hemisphere
- Swallow latency prolonged if BG infarcts

No infarcts	12.9%
Unilateral BG infarcts	27.4%
Bilateral BG infarcts	47%
Hemisphere infarcts	8%

L Dopa

Kobayashi et al 1998

- Basal Ganglia Infarcts
- 27 pts, mean age 78 yrs
- 20 controls, mean age 75 yrs
- Swallow recorded on EMG, latency response
- Randomised double blind cross over

L Dopa

- IV L Dopa vs saline
- Latency reduced from 8.3 to 2.9 secs

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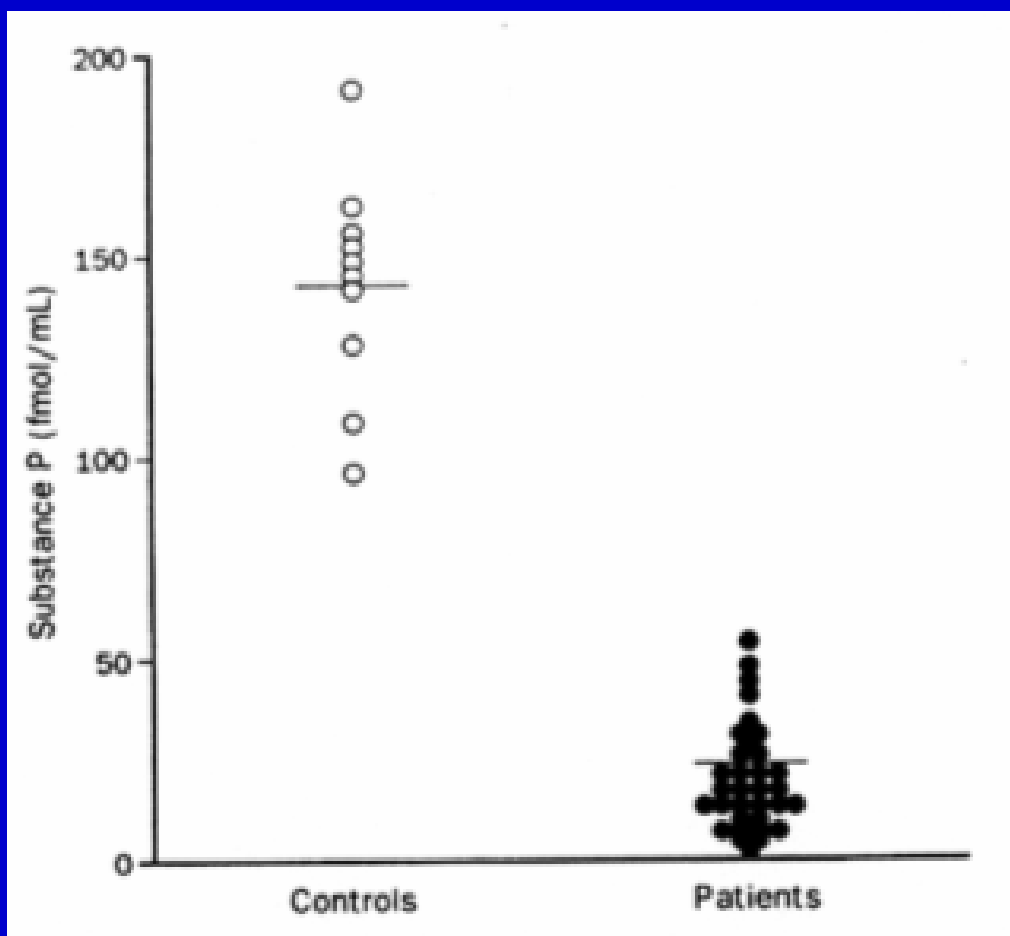
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Substance P

Nakagawa et al 1995

- 32 patients
- Mean age 77 years
- 1 episode of aspiration pneumonia

- 10 controls
- Mean age 73 years



Amantadine

Nakagawa et al 1999

- Amantadine 100 mg vs placebo
- 3 years
- RR for pneumonia 5.92

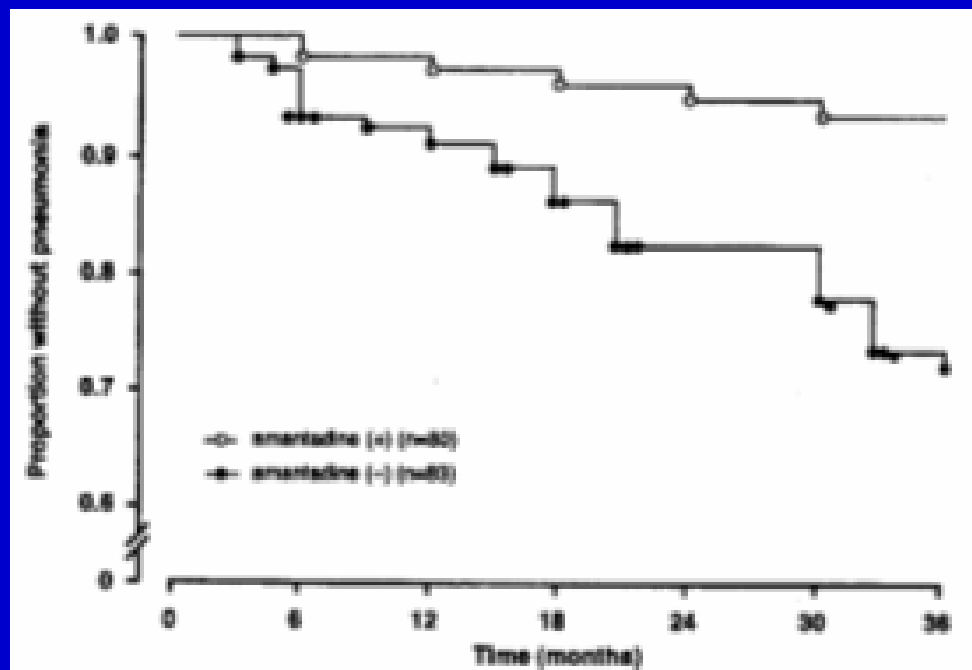


Figure 3. Kaplan-Meier plots of the proportion of patients without pneumonia using amantadine (○) and not using amantadine (●).

Angiotensinogen

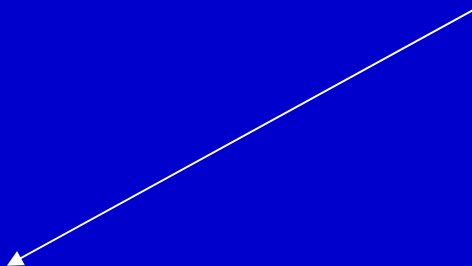


Angiotensin 1

ACE-I



Angiotensin 2



Substance P

ACE I

- Reduction in silent aspiration
 - 7% vs 18%
- Reduction in pneumonia in those on ACE-I for hypertension
- Increased Substance P in sputum
 - 26.5 pg/ml to 82.91 pg/ml

ACE-I

Shibuya et al 2002

- 143 patients with CVD
- 3 year follow up
- Reduced aspiration if taking ACE-I compared to other anti HT

ACE-I

Sekizawa et al 1998

- 127 pts with stroke – ACE-I for HT
- 313 pts with stroke – other anti HT
- 2 year follow up
- 7% vs 18%
- RR 2.65; 95% CI 1.3, 5.3

ACE-I

Arai et al 2001

- 576 older people with HT
- ACE-I vs CCB
- Pneumonia 3.3% vs 8.9% $p=0.025$

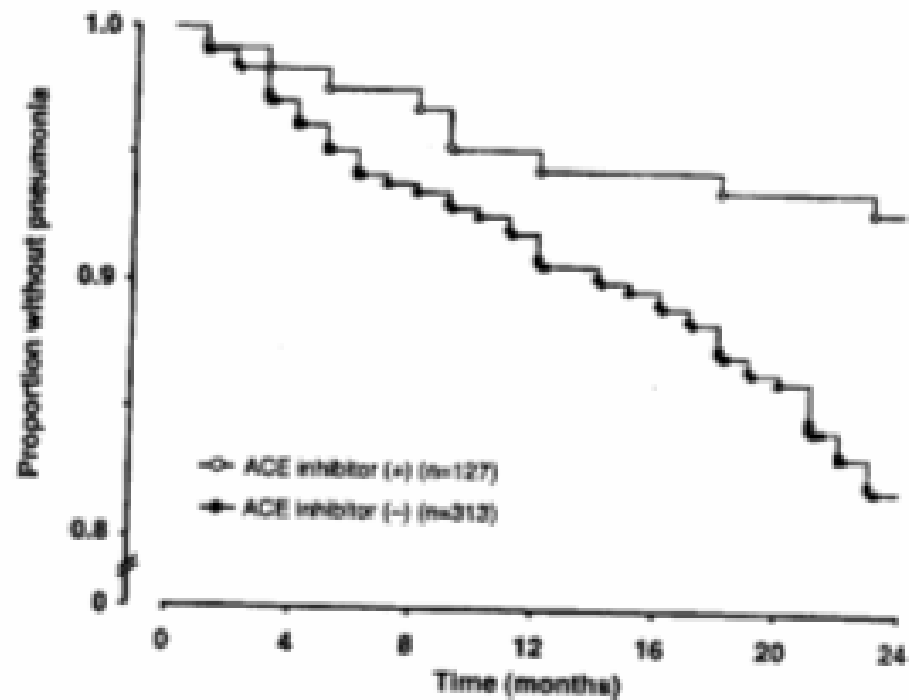


Figure 2. Kaplan-Meier plots of the proportion of patients without pneumonia using an ACE inhibitor (○) and not using an ACE inhibitor (●).

Amantadine and ACEI

Kanda et al 2004

- Stroke Pts >65 yrs
- Admitted with CAP
- Impaired swallow and cough
- Lisinopril and amantadine
- LoS reduced from 51(36) to 37(22) days
- Reduced MRSA infection

DA agonist vs ACE-I vs Amantadine

- All reduced SA over night
- DAA 10/13 (76.9%)
- ACE-I 9/12 (75%)
- Aman 10/14 (71.4%)

Nifedipine

Perez et al 1997

- Oral Nifedipine MR 30 mgs
- Moderate Dysphagia
- 2 weeks after stroke
- Reduced
 - Pharyngeal Transit Time
 - Swallow Delay
 - Pharyngeal Response Time

Nifedipine following stroke

- Reduction in
 - mean pharyngeal transit times
 - 1.34 secs 95CI -2.56, -0.11
 - mean swallow delay
 - 1.91 secs 95CI -3.58, -0.24)

Stimulation

- Faucial
- Pharyngeal
 - Extra pharyngeal
 - Intra pharyngeal
- Act via irritation?

Capsaicin

- Extract of red pepper
- Stimulate C fibres
- Increase Substance P in pharyngeal epithelium
- Add to food

CP Spasm

- Botulinum Toxin
 - Local injection
- Nitrates
 - Smooth muscle effect

Conclusions

- Interesting Studies
- Small
- ? Relevance to day to day patient management
- Further work required.

The Future

- Is substance P the final common pathway
- Are ACE-I the answer?
- Should all patients with mild/ moderate dysphagia be prescribed medication?