

# Treatment protocols at ECT

---

Dr Grace Fergusson

Scottish ECT Audit Network August 2000

# Treatment protocols

---

- ◆ past
- ◆ present
- ◆ future

Scottish ECT Audit Network August 2000

This seminar will

- give an overview of the development of treatment protocols at ECT
- point to some of the evidence for present day guidelines
- outline the questions still to be answered

## development of protocols

---

- ◆ *1939-69*: high efficacy  
high side-effects
- ◆ *1975-85*: low efficacy  
low side-effects
- ◆ *1985-00*: search for therapeutic supremacy

Scottish ECT Audit Network August 2000

- The first thirty years of ECT saw the use of high dose treatment regimes.
- Ultra low dose treatments followed for the next ten years.
- Over the last five years attempts have been made to find the formula for maximum efficacy and minimum side-effects.

## development of protocols (2)

---

*1939 - 69:*

- ◆ sine wave electricity
- ◆ little attention to dose
- ◆ side-effects accepted or ignored

Scottish ECT Audit Network August 2000

- In 1939 ECT had a dramatic effect and was soon adopted as a mainstream treatment for depression.
- Little attention was paid to the dose of electricity and cognitive side-effects were even thought desirable by some psychiatrists.
- Anaesthesia for ECT was introduced in the 1950's and this made the whole process of treatment much safer.

## development of protocols (3)

---

*1969 - 85:*

- ◆ any seizure activity accepted
- ◆ re-introduction of pulsed wave forms
- ◆ doses of electricity low
- ◆ unilateral ECT
- ◆ College statement 1977

Scottish ECT Audit Network August 2000

- By 1970 there was a renewal of interest in ECT machines which could deliver brief pulses of electricity.
- This together with the belief that unilateral ECT was as effective as bilateral ECT saw the introduction of treatment protocols which used very low doses of electricity.
- A Royal College of Psychiatrist's statement in 1977 ratified the use of ECT as a treatment in psychiatry.

## development of protocols (4)

---

1985 - 89:

- ◆ importance of dose intensity
- ◆ 25 sec seizure as a guide
- ◆ College guidelines 1989

Scottish ECT Audit Network August 2000

- By the early 1980's clinicians had reverted back to using bilateral ECT because the 'new' unilateral treatment appeared ineffective.
- It had become evident that more than just 'any seizure activity' was required for efficacy.
- and that something about the *intensity* of the electrical dose was important.
- The Royal College of Psychiatrist's guidelines of 1989 suggested that, as a guide, a seizure of at least 25 seconds should be observed.
- Bilateral ECT was recommended as the treatment of choice.

## intensity of electrical dose

◆ Lambourne & Gill	1978	(L & G)*
cf.		
◆ Royal Edinburgh DB trial	1979	(RE)
◆ Northwick Park ECT trial	1980	(NWP)
◆ Sutton Hospital DB trial	1981	(SH)
◆ Leicestershire trial	1984	(L)

\*see notes

Scottish ECT Audit Network August 2000

- Some evidence for the importance of ‘intensity’ of dose (or energy level) can be found in the series of double blind trials 1978-84.
- All these studies looked at real vs. ‘sham’ ECT.
- The L & G study used *unilateral, brief pulsed* ECT(very low energy) and showed *no difference* in outcome.
- The NWP study used *bilateral, brief pulsed* (low energy) ECT and the difference was *equivocal*.
- The RE, SH and L studies all used *bilateral, chopped sine* wave (high energy) ECT and there was a *significant difference* with real ECT.

## intensity of electrical dose (2)

A double blind controlled comparison of the therapeutic effects of high and low dose energy electroconvulsive therapies. Robin and deTissera. BJPsych. 1982:141

1. low dose
2. high dose with pulsed energy
3. high dose with chopped sine wave

**results:same seizure length**

**2 and 3 more efficacious; 3 more side-effects than 2**

Scottish ECT Audit Network August 2000

- In 1982 Robin and de Tissera looked at outcome using three different ECT machines.
- There was no difference in terms of patient populations treated
- There was no difference in terms of the length of seizure produced.
- But there was a relationship between intensity of electrical dose and outcome ie  
the higher the dose the better the antidepressant effect  
the higher the dose the more chance of side-effects.



## development of protocols (5)

---

*1989 - 95:*

- ◆ concept of seizure threshold (ST)
- ◆ variability in seizure threshold
- ◆ change in ST with treatment
- ◆ treatment to suit the individual
- ◆ College guidelines 1995

Scottish ECT Audit Network August 2000

- The seizure threshold is the minimum amount of electricity which will trigger a seizure in a given individual.
- It is the amount by which a dose of electricity exceeds this seizure threshold that determines both the efficacy and side-effects of ECT.
- Early work from the USA suggested a 40 fold variation in individual seizure thresholds. Research carried out more recently in GB concludes this variation is in the region of 4 - 10 fold.
- The patient seizure threshold can be
  - i) measured or
  - ii) estimated according to certain variables eg sex, age
- The 1995 College guidelines gave examples of both methods.

## millenium treatment protocols

---

- ◆ bilateral ECT as treatment of choice
- ◆ dose 50-100% above seizure threshold (ST)
- ◆ measure seizure length as a guide to ST
- ◆ restimulate 'missed' seizures, higher dose
- ◆ terminate prolonged seizures

Scottish ECT Audit Network August 2000

- The College handbook is under review.
- The present guidelines for the most cost-effective treatment appear in the above slide.
- The next slide shows some of the evidence for the choice of bilateral ECT at moderately supra threshold doses.

## efficacy data for setting dose

Sackeim et al. (series of studies 1991 - 93, USA)

- ◆ low dose UECT - 28% response
- ◆ low dose BECT - 70% response
- ◆ same seizure length
- ◆ cognitive side-effects related to dose above seizure threshold rather than absolute dose

conclusion: best outcome when the dose exceeds seizure  
(BECT) threshold by 50 - 100% for a given individual

Scottish ECT Audit Network August 2000

- In a series of studies Sackeim concluded that:
- Low dose bilateral ECT was more effective than low dose unilateral ECT.
- Low dose bilateral ECT was faster acting than high dose unilateral and less likely to end in relapse
- Cognitive side-effects for bilateral ECT were related to the dose above seizure threshold rather than the absolute dose of electricity.
- Outcome was best when the dose of electricity was 50 - 100% above seizure threshold.

## seizure threshold - first ECT

- ◆ measure. pros: specific  
therapeutic, despite seizure length  
decreased risk of overdose
- cons: time under anaesthetic  
risks of repeated stimulation?
- ◆ estimate. pros: quick
- cons: variation from the mean in 1 in  
20 so need clinical feedback

Scottish ECT Audit Network August 2000

- There are two ways to work out the seizure threshold
  - i) the first is to measure it by starting off with a low dose of electricity and increase by small increments until a seizure is produced.
  - ii) the second is to estimate the seizure threshold by using a table of variables often available from the machine manufacturer, which for example takes into account the patient's sex, age and concurrent medication.
- The pros and cons of each method are summarised in the above slide.

## variations in seizure threshold

---

<i>raised by:</i>	incr. age	<i>lowered by:</i>	female sex
	male sex		low CO 2
	dehydration		some drugs
	low oxygen		caffeine
	propofol		unilateral electrodes
	propranolol		
	benzodiaz.		
	bilateral electrodes		

Scottish ECT Audit Network August 2000

- This slide shows some of the factors which can affect the patient's seizure threshold.
- Note that ECT itself has anti-convulsant properties.

## subsequent treatments

(seizure threshold measured)

- ◆ monitor length of seizure
- ◆ increase dose if fit length falls by 30-50%
- ◆ re-titrate after 6th ECT

Scottish ECT Audit Network August 2000

- The first ECT session measures the seizure threshold (ST).
- At the second ECT session a therapeutic treatment can be given (50-100% above ST).
- The fact that the electrical dose has been measured means that less emphasis needs to be placed on the seizure length.
- However the seizure length is still recorded as this gives an indication of any increase in seizure threshold as the course of treatment progresses.
- Treatment protocols should respond to a significant fall in seizure length by increasing the dose of electricity to remain 50 - 100% above seizure threshold.
- The seizure threshold can be measured again after say 6 ECT treatments if there is any doubt or concern.
- Treatment protocols should take account of clinical feedback.

## subsequent treatments

(seizure threshold estimated)

- ◆ take account of clinical picture
- ◆ reduce dose if any cognitive side-effects
- ◆ increase dose if fit length falls by 30-50%
- ◆ increase dose if no improvement

Scottish ECT Audit Network August 2000

- An estimated treatment dose of electricity is given at the first ECT session.
- It is vital that the clinical response is monitored because there may be a 1 in 20 variation from the mean in seizure threshold estimation.
- A dose of electricity too high above seizure threshold may result in cognitive side effects.
- A dose too low is likely to be ineffective.
- Treatment protocols must therefore take account of clinical feedback especially if there has been any post treatment confusion.
- Again the seizure length is recorded to give some indication of a change in seizure threshold as the course of treatment progresses.

## initial seizure threshold

<u>first dose</u>	<u>1997</u>	<u>1999</u>
<u>of ECT</u>	<u>(n=36)</u>	<u>(n=35)</u>
	%	%
measured	22	26
estimated	56	63
fixed	22	11

(Scottish Audit of ECT 1997-00)

Scottish ECT Audit Network August 2000

- The next 3 slides show some results from the national audit of ECT in Scotland from 1997-2000.
- By 1999 89% of ECT units had adopted the College recommendation that the first dose of ECT should not be 'fixed', ie the same for everyone.



## stimulus dosing protocols

---

### Scotland

1994:	77%
1997:	89%
1999:	94%
2000:	100%

(E & W in 1996: 34%)

Scottish ECT Audit Network August 2000

- Stimulus dosing protocols allow the dose of ECT to be altered according to response, for example:
  - to take account of missed or partial seizures
  - to take account of prolonged seizures
  - to take account of the seizure length as the course of treatment progresses
  - to take account of clinical feedback.

## outcome in a clinical setting

### definite improvement (MADRS/CGI)

<u>diagnosis</u>	<u>1997</u>	<u>1999</u>
depressive illness	72%	72%
schizophrenic illn.	66%	61%
manic illness	65%	68%

Scottish ECT Audit Network August 2000

- The national audit of ECT in Scotland looked at outcome in a clinical setting.
- The Montgomery Asberg Depression Rating Scale (MADRS) was used to measure change in those patients being treated for a depressive illness.
- The Clinical Global Impression (CGI) was used as an outcome measure for other diagnoses.
- The audit standard was set at:  
‘at least a 50% reduction in the MADRS in 70% or if more relevant a definite improvement in the CGI for the majority of patients’
- The above slide shows the percentage of patients reaching the audit standard.
- So, in line with the Welsh audit 1996, this audit confirms that ECT is effective in a clinical setting.

## questions for 2001

---

- ◆ is seizure threshold measurement worthwhile in a routine clinical setting?
- ◆ is high dose unilateral ECT a better option?
- ◆ what can we gain from EEG monitoring?

Scottish ECT Audit Network August 2000

- Some questions remain unanswered.
- There is still debate about whether it is worthwhile measuring seizure threshold if dosing strategies are kept low and the clinical picture is monitored.
- There is a renewal of interest in unilateral ECT given at very high doses ( 5 times seizure threshold). This may be as effective as low dose bilateral ECT without the risk of cognitive side-effects but results of recent research needs to be replicated. (see next slide for comparison)
- And American ECT machines now available in GB offer EEG monitoring.

## choice of electrode placement

<u>type of ECT</u>	<u>outcome</u>	<u>side-effects</u>
1. low dose UECT	22%	
2. high dose UECT (2.5 x ST)	70% (high relapse)	I
3. low dose BECT	70%	II
4. high dose BECT	80%	III

Sackeim et al. New Eng J of Medicine, 1993. 328:839-846

Scottish ECT Audit Network August 2000

- Early work looking at the effects of unilateral vs bilateral ECT used doses of electricity 2.5 times seizure threshold for unilateral ECT.
- More recent studies from USA have used doses upto 5 times seizure threshold for unilateral ECT and early results are promising; there may be a relation between level above seizure threshold and efficacy.
- If this is confirmed then very high dose unialeral ECT may become the treatment of choice because even at these levels cognitive side-effects may be less than with bilateral ECT regimes.
- More recently treatment protocols in GB are becoming more flexible and allow for a choice in treatment modality  
eg. start with unilateral and switch to bilateral if no improvement or start with bilateral and switch to unilateral if cognitive side-effects are troublesome.

## EEG monitoring

---

- ◆ detection of prolonged seizures
- ◆ indication of efficacy??

Scottish ECT Audit Network August 2000

- Evidence in support of the routine use of EEG monitoring is being considered by the College.
- Some studies suggest a 2-4% incidence of prolonged cerebral seizure activity not accompanied by prolonged motor activity.
- Another has shown only a 60% correlation between cerebral seizure and peripheral motor activity.
- Therefore from a safety angle there may be some justification in monitoring at least the first treatment as prolonged seizures are more likely at this stage.
- As yet there have been no confirmed studies which have demonstrated a direct relationship between post ECT EEG changes and clinical outcome, despite the claims of some machine manufactures.

## conclusion

---

ECT is a safe and effective treatment  
*provided*  
care is taken to fit the treatment to the patient

Scottish ECT Audit Network August 2000

- ECT is a safe and effective treatment provided care is taken to fit the treatment to the patient.
- Much more is now known about the mechanisms of ECT and there is a lot of interesting research emerging which continues to inform the development of treatment protocols.
- It is the responsibility of the ECT consultant to keep abreast of developments and provide adequate training and supervision for junior staff.