THE MANAGEMENT OF PAROXYSMAL TACHYCARDIA INCLUDING THE USE OF MECHOLYL*

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Paroxysmal supraventricular tachycardia is a common functional heart disorder of all ages but particularly of young adults without organic heart disease. Relatively few attacks are seen by physicians, since attacks cease spontaneously or the patient has learned ways of stopping them. Of the persons seeking medical aid for this arrhythmia, a few find their attacks resist ordinary physical means and oral therapy and persist for hours and sometimes many days before they spontaneously cease. Deaths have been recorded, as have hemiplegia and gangrene as thrombotic sequelae of the low pulse pressure and minute output during such attacks. A history of paroxysmal tachycardia rejects applicants for army air crew and flying personnel and electrocardiographic evidence is cause for rejection of army officer candidates, but since first attacks are common in young adults it is probable that Army Surgeons will occasionally have to manage such problems.

Advice for the prevention of attacks is principally directed to extracardiac somatic factors and these vary with the individual patient. If drugs are indicated because attacks are frequent and tend to persist and annoy the patient, quinidine is best, but an occasional patient responds better to digitalis. Sedatives are helpful in the physician's program of reassurance, and sometimes are all that is required when observant patients realize that a contemplated experience may precipitate an attack. A typical example was that of a young college instructor who told me several years ago that he was subject to attacks when he traveled to see his sweetheart whom his family disliked as much as her family disliked him, but that the attacks could be prevented by 15 grains of bromides.

It is recognized that the psychic factor is a great one in these problems from several angles. It may act as a direct precipitating factor for attacks and a healthy person may develop an incapacitating neurosis because of ill founded notions of the significance and prognosis of his disorder. Reassurance, therefore, must be definite and backed by proved ability to terminate attacks as promised. The published facts are that people have been known to have attacks for over 50 years and have no influence on longevity, and if organic heart disease exists the prognosis depends on the underlying heart disease.4

A healthy vigorous man of 73 told me that he had had attacks occasionally for 30 years and had learned long since to disregard them. His son, 50, was just becoming convinced after five years' similar experience that his

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attacks were no cause for concern. He knows carotid sinus pressure stops them and that 1½ grains of digitalis every second day will prevent them and that quinidine is less effective. Some form of carotid sinus reflex elicitation will stop the majority of attacks. The patient deserves to be carefully instructed in carotid sinus pressure, ocular pressure, the Mueller and Val Salva experiments and told about the benefits of postural change and vomiting. These six physical procedures in addition to some schemes which his experience may have taught him provide an armamentarium which in itself offers more than passive reassurance. Pressure on the eyeballs has to be enough to cause the patient some discomfort and the patient should look down while pressure is exerted. The Mueller and Val Salva experiments are easy for the patient to execute without notice, since in one the patient strains to exhale but keeps his glottis closed and in the other he strains to inhale but keeps his glottis closed. Various combinations of these procedures have caused slowing of paroxysmal fast heart rates when single procedures have failed. To induce vomiting, apomorphine has been used and syrup of ipecac in doses of from one to four drachms 9, 19 has been a favorite of some good clinicians as a treatment of attacks.

When the physical methods have been tried or before trying them the patient can be instructed to take his usual dose or a double dose of quinidine at two hour intervals for two or three doses or until tinnitus is noticed. In this manner patients have tolerated as much as 100 grains in one day. 18 If there is any tendency for him to develop an apprehensiveness, he should be provided with an effective sedative which he can take early in the attack and allow himself to assume a semirecumbent or recumbent position unless he knows that such positions tend to bring on attacks. 8 It has been thought that not until such procedures have been well tried and heart tones are becoming less vigorous or signs of basal râles or very annoying systemic signs have appeared was one justified in using parenteral quinidine or mecholyl or intravenous strophanthin or digitalis. One reported attack of 10 days' standing, several years ago, was stopped when quinidine had failed with 15 cat units of digitalis intravenously. 22 Just recently intravenous metrazol has been used with satisfactory results. 5 Intravenous quinidine is frequently referred to in the literature but I have encountered no reliable available preparation for this purpose. Just recently Sturnick, Riseman and Sagall 16 pointed out that "soluble preparations of quinidine sulphate for parenteral administration have not been readily available." This statement is true despite the fact that solutions of quinine dihydrochloride are commercially available in ampoules and have been administered intramuscularly and intravenously and dilute solutions of quinidine sulphate in dextrose or water and suspension of quinidine sulphate tablets in hot water and hydrochloric acid have been used in emergencies. 21 Sturnick, Riseman and Sagall 16 published their experiences with a preparation recommended by the Cinchona Products Institute, but the preparation requires more than average facilities since sterilization was achieved by passage through a Berkefeld filter. If the
preparation could be made commercially available it would apparently be an
improvement over quinidine preparations now in use. The drip method of
intravenous quinidine administration is the safest but it takes such a long
time that one can wonder whether it was quinidine or the passage of time
which stopped the tachycardia. In the choice of any heroic procedure it is
comforting to know that the effects of the drug can be quickly stopped at
any moment and in that regard mecholyl has an advantage over the others.

For terminating attacks mecholyl, now council accepted for this purpose,
is advised in the War Department’s Technical Manual entitled “Notes on
Cardiology in Aviation Medicine,” and it has received increasingly favorable
mention in the literature since first described for this purpose by Starr in
1933. Detailed comment on the drug’s history, its action and a practical
scheme for its use have been omitted from most articles concerning the treat­
ment of paroxysmal tachycardia.

The use of the various cholines has been a development of the present
age. Acetylcholine was first synthesized by Baeyer in 1867 but had only a
chemical interest. In 1914 Dale noted that the chemical mimicked the ef­
fects of stimulation of the parasympathetic nerves. Starr and others later
made investigations which have provided a sound basis for the use of avail­
able cholines in medicine. Acetyl-beta-methylcholine or mecholyl is one of
the few cholines stable enough and with sufficient investigation behind it to
deserve a place in our therapeutic armamentarium. When it reaches the
tissues it is probably in a form which duplicates products of the body itself.
Its greatest usefulness is in treating paroxysmal supraventricular tachycardia,
and it has no place in treating other arrhythmias. It has been used in per­
sons of all ages from infancy to old age. Atropine or epinephrine will
abolish its effects and quinidine tends to block its action. Oral administra­
tion has been unsatisfactory either to prevent or stop attacks. Mecholyl
should never be given intravenously, since the effects of hypodermically ad­
ministered therapeutic doses are so rapid and dramatic that anyone who has
not been appraised of them should familiarize himself well with the effects,
and should not undertake to use the drug unless he follows very carefully a
set procedure. However, if this is done, the physician can avail himself of
an effective agent which he can control at will.

I have had only a few patients whose attacks have failed to respond as
desired to oral quinidine, sedatives and the physical measures mentioned, but
I decided to use mecholyl on resistant electrocardiographically proved supra­
ventricular tachycardias after a visit to Dr. Starr’s Clinic several years ago.
Though I have employed it in treating only 12 attacks, the effect has been so
uniform and in accord with the descriptions of the investigators that I feel
the drug merits wider use. Even among competent internists I have en­
countered a sense of fear and hesitation when use of this drug is mentioned.
Starr has always advised that in giving mecholyl “one should have a syringe
of atropine ready for intravenous administration” but lately adds that he has
not had to use it for many years, since he simply applies a tourniquet above
the site of injection when the action appears excessive as shown by nausea and vomiting. Since the effect of mecholyl on the bronchial tree is to cause bronchial spasm, it has been suggested that in asthmatic subjects the drug be either not used or else even greater care than usual be employed. In hyperthyroid patients mecholyl is capable of inducing auricular fibrillation and for this reason hyperthyroidism is sometimes considered a contraindication for this therapy though Starr has noticed no ill effects from mecholyl in such cases.8, 12

The patient receiving mecholyl should be recumbent, since the erect posture at the height of the drug’s action may cause fainting. A bed pan should be ready for the same reason in case the subject should have a sudden desire to defecate during the drug’s action which is a possibility though none of my patients has had more than active audible peristalsis.

It is well to explain to the patient and to any relatives who insist on being present during the treatment each of the subjective and objective manifestations of the mecholyl effect before giving the injection. In less than a minute a brilliant flush comes in a wave over the blush areas, perspiration and salivation are profuse, and peristalsis becomes audible. Even if appraised before, the patient usually makes some comment concerning these things because they come so quickly. A medical colleague whose tachycardia I terminated with mecholyl without a previous sedative was so impressed that he decided to refer any resistant tachycardias for such therapy, and he volunteered the suggestion that the use of such a drug should be in the hands of someone other than a general practitioner such as himself. Having used the drug both with and without the previous administration of a sedative, I believe it is better to administer something to dim slightly the perceptive senses before using mecholyl. For this I have used a therapeutic dose of morphine sulphate. I have recently discussed this with Dr. Starr who says it is perfectly proper and who, although he has not used a sedative, is interested in the idea.12 So with the patient and nurse or relative posted on coming events and contraindications considered and a sedative in effect, one can proceed.

The average dose of mecholyl for adults is 20 to 50 milligrams and it is available in sealed glass ampoules of the dry drug each containing 25 milligrams. The contents of each ampoule are easily soluble in 1 c.c. or less of sterile distilled water introduced into the ampoule. So that no confusion arises one can either use differently marked syringes or place the empty mecholyl ampoule over the needle of the syringe filled from it. Atropine gr. ½ in solution ready for intravenous injection is in the second syringe. The arm with easily accessible veins is selected and a blood pressure cuff is applied or good tourniquet placed loosely high on the upper arm. Mecholyl is then administered subcutaneously below or distal to the blood pressure cuff which is not inflated. At the moment the heart rhythm and rate return to normal as detected by the stethoscope over the precordium, the blood pressure cuff is inflated to prevent further absorption and to make a vein ready if desired for
the administration of atropine. The return to sinus rhythm has occurred in my experience as early as 80 seconds following the mecholyl injection and has been reported in less time. If no effect on rate is noted by the time the drug is at its peak effect as manifested by flush in the blush areas, perspiration, salivation and loud peristalsis (2 to 10 minutes) Starr has suggested massage of the site of injection and also carotid sinus stimulation by one of the above physical means. This is necessary in some 20 per cent of cases. If no effect is manifest 30 minutes after the injection, another dose can be given. The drug does not lose its effectiveness by repeated use as indicated by a report of its successful use in stopping 15 of 16 attacks recurring in a child over a two year period. I have had a similar successful experience in eight attacks out of nine in a middle-aged woman over a three year period.

The first time it was used on this patient it was ineffective because only 25 milligrams were given and no second dose was used and later experience demonstrated that 40 to 45 milligrams were needed. On several occasions she had 8 to 10 grains of quinidine within three hours of satisfactory mecholyl treatment, which supports the statement that mecholyl can break through the quinidine effect. The reliability and short time necessary to abolish the tachycardia which this woman has been having occasionally for 25 years have made her grateful. Most of her attacks cease spontaneously or with repeated oral doses of quinidine, but if they persist for a few hours she now has them stopped whereas previously she has been incapacitated at least a day or two. In a middle-aged man whose attack had resisted usual therapy for 10 hours a second dose of 60 milligrams reinforced with carotid pressure was given with success after one of 40 plus carotid sinus stimulation plus massage of the site of injection had failed.
No deaths have been reported from the use of the drug, but reports are available of great overdose (10 and more times the therapeutic dose) and mistaken intravenous administration and in each instance recovery was complete.

Each of my patients' rhythm was proved electrocardiographically but I was not fortunate enough to secure a tracing during the transition to normal sinus rhythm. Such tracings have been published and support what one hears with the stethoscope. In each attack that I have treated with mecholyl the rapid rhythm was interrupted by a brief period of asystole, then the next few beats seemed slightly slower than the normal sinus rhythm which was quickly established. The quick transition from a heart rate of 160 to 180 to one of 70 or 80 with the brief asystole is usually noted by the patients, though the relief from the rapid rate is ample reward for the brief moment of what they have termed a "funny feeling."

**SUMMARY**

1. Paroxysmal supraventricular tachycardia is a common functional cardiac abnormality usually seen in normal hearts but has been fatal and has led to disabling thrombotic conditions. A history of it disqualifies for air crew and flying personnel, and electrocardiographic evidence is cause for rejection in candidates for army commissions, but since the first attack may occur at any age it is probable that cases will be observed occasionally in our armed forces. Most attacks do not require medical attention, but it is estimated that 10 to 20 per cent defy the patient's efforts to stop them.

2. To prevent attacks direct therapy is usually not indicated, but attention is given extracardiac somatic factors; reassurance to the patient and investigation of psychic factors are indicated; if drugs are desired quinidine sulfate is most effective, digitalis is occasionally more satisfactory, and sedatives usually help.

3. Therapy of attacks: Carotid sinus reflex elicitation; sedatives; oral quinidine. If the latter is ineffective, digitalis has been used either orally or parenterally, but mecholyl is preferred if parenteral therapy is indicated.

4. Advantages and steps in the use and control of mecholyl are outlined and cases cited.

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