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# Comparison of Different Treatments of Atrial Fibrillation in the Horse

By

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*With 2 figures and 3 tables*

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## Introduction

The oral administration of quinidine sulphate in increasing doses is a well known method of treatment of atrial fibrillation in the horse (Detweiler, 1952; Glendinning, 1965; Zerobin and Leemann, 1965; Kroneman and Breukink, 1966). This procedure, although very effective, has two disadvantages: 1. Frequent intervention, with possible damage to the horse and operator; 2. Use of large quantities of quinidine, wich lead to high cost of treatment and a serious danger of toxicity.

Several authors (Gerber et al., 1971; Deegen and Buntenkötter, 1974; Rose and Davis, 1977) have described procedures of treatment less laborious and less onerous than those recommended previously.

The object of our study was to compare the different methods from the point of view of efficacy, quantity of drug required, duration and convenience of the treatment as well as toxicity.

## Material and Methods

### *Cases histories*

The investigations were carried out on 7 cases of atrial fibrillation diagnosed by electrocardiography. The information about these horses is given in Table 1.

### *Anti-arrythmic treatment*

Each horse was isolated in a quiet box during the treatment.

Cases 1, 2 and 3 were given 1 % quinidine sulphate solution by slow and continuous intravenous injection until cardioversion was achieved. The rate of administration was 83 mg./min. for case 1 and 150 mg./min. for cases 2 and 3.

*Table 1*
Cases histories

| N° | Age (years) | Sex | Breed | Referred for | Duration of the trouble | Other pathology |
|---|---|---|---|---|---|---|
| 1 | 5 | stallion | trotting | lowered performance | >1 year | laryngeal hemiplegia |
| 2 | 4 | gelding | trotting | lowered performance | 1 month | none |
| 3 | 8 | mare | draught | lameness | ? | pododermatitis |
| 4+ | 5 | stallion | trotting | recurrence of A. F. | >1 year | laryngeal hemiplegia |
| 5 | 18 | gelding | standardbred | loss of fitness | 1 month | systolic murmur |
| 6 | 11 | stallion | standardbred | lowered performance | 2 years | none |
| 7 | 14 | gelding | standardbred | routine examination | ? | none |

A. F. = atrial fibrillation. + Case 4 is the same horse as case 1 which presented a recurrence 2 months after the first treatment and was treated again 1 month later.

Cases 4, 5 and 6 were given 1 % dihydroquinidine chlorhydrate solution by the same route. The rate of administration was 150 mg./min., but, because of the appearance of paroxysmal ventricular tachycardia, the rate of administration was reduced to 40 mg./min. after 2 hours of treatment for case 4 and 50 mg./min. after 2 hours 30 min. for case 6.

Case 7 was given 10 gr. of quinidine sulphate by stomach tube every 2 hours until cardioversion was achieved.

The quantities of drug administered and the duration of the different treatments are given in Table 2.

*Investigations carried out*

The ECG was recorded before, during and after each treatment by a one-channel telemetric system[3]. The signals were registered continuously both with a direct signal recorder and on magnetic tape[4].

The adhesive electrodes were fixed on the withers (negative pole) and on the xiphoid appendage (positive pole), the transmitter being fixed on the horse by a surcingle.

*Table 2* Comparison of the

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| Route of administration | I. V. | I. V. | I. V. |
| Drug administered | Q. S. 1 % | Q. S. 1 % | Q. S. 1 % |
| Speed of administration | 83 mg / min | 150 mg / min | 150 mg / min |
| Quantity of drug administered | 20 g | 10 g | 40 g |
| Duration of treatment | 4 h 2 min | 1 h 6 min | 4 h 20 min |
| Cardioversion | + | + | – |
| Recurrence to date | + | – | |

Q. S. = quinidine sulphate; DHQ. CHL. = dihydroquinidine chlorhydrate.

The possible signs of toxicity were searched for, especially at the level of the digestive, nervous, locomotor and cardiovascular systems.

## Results

### *Efficacy of the treatments*

All the horses showed cardioversion after the treatment except cases 3 and 6. Up to now, no recurrence has been observed, except for case 1.

[3] Danica electronica.
[4] Advancemed. Both instruments were provided by the Belgian P. M. U. (President: Prof. Dr. A. HENNAU).

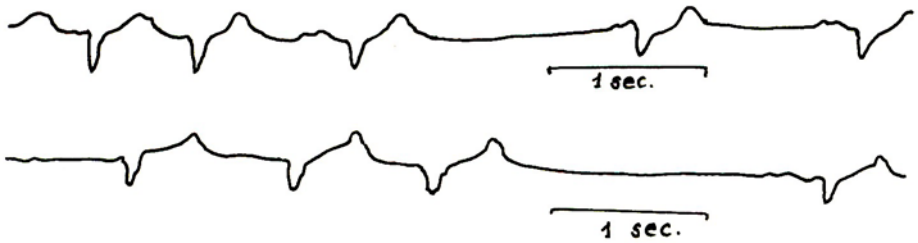


Fig. 1. ECG recordings of the case 1 (top tracing) and case 7 (bottom tracing) at the time of cardioversion

### *Evolution of the heart rate*

The course of development of the resting heart rate is shown in Table 3.

### *Modifications of the ECG signals*

In addition to the changes in the atrial waves, we also observed that the treatment induced some modifications of the ventricular waves: 1. The T wave became openly positive and with a high amplitude; 2. Surelevation of the ST segment; 3. Increase of amplitude of the QRS complex (Fig. 2).

All these modifications appeared very soon after the start of treatment and disappeared completely 24 hours later.

### *Signs of toxicity*

Cases 1, 2, 6 and 7 showed no signs of toxicity. Cases 4 and 5 showed slight signs of ataxia at the end of the treatment and for a few hours afterwards. Case 3 presented a progressive ataxia with prostration at the end of treatment. Its clinical state improved 2 hours after the end of the perfusion and was normal 12 hours later. No other signs of toxicity were detected.

different treatments

*Table 2*

| Case 4 | Case 5 | Case 6 | Case 7 |
|---|---|---|---|
| I. V.<br>DHQ. CHL. 1 %<br>a) 150 mg / min<br>b) 40 mg / min<br>23 g<br>4 h 11 min<br>+<br>– | I. V.<br>DHQ. CHL. 1 %<br>150 mg / min<br><br>15 g<br>1 h 41 min<br>+<br>– | I. V.<br>DHQ. CHL. 1 %<br>a) 150 mg / min<br>b) 50 mg / min<br>40 g<br>8 h 30 min<br>– | per os<br>Q. S. 1 %<br>10 g every<br>2 hours<br>40 g<br>7 h 28 min<br>+<br>– |

*Table 3*

Resting heart rate before, during and after treatment

| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 |
|---|---|---|---|---|---|---|---|
| Before treatment | 58 | 58 | 62 | 45 | 40 | 35 | 40 |
| 1 hour after the start of treatment | 62 | 72 | 82 | 90 | 64 | 70 | 38 |
| 2 hours " " " " " | 60 | - | 82 | 74 | - | 72 | 42 |
| 3 " " " " " " | 63 | - | 82 | 70 | - | 70 | 47 |
| 4 " " " " " " | 65 | - | 96 | 68 | - | 60 | 46 |
| At the time of cardioversion | 58 | 56 | - | 60 | 48 | - | 48 |
| 24 hours after treatment | 48 | 40 | - | 40 | 42 | 34 | 33 |

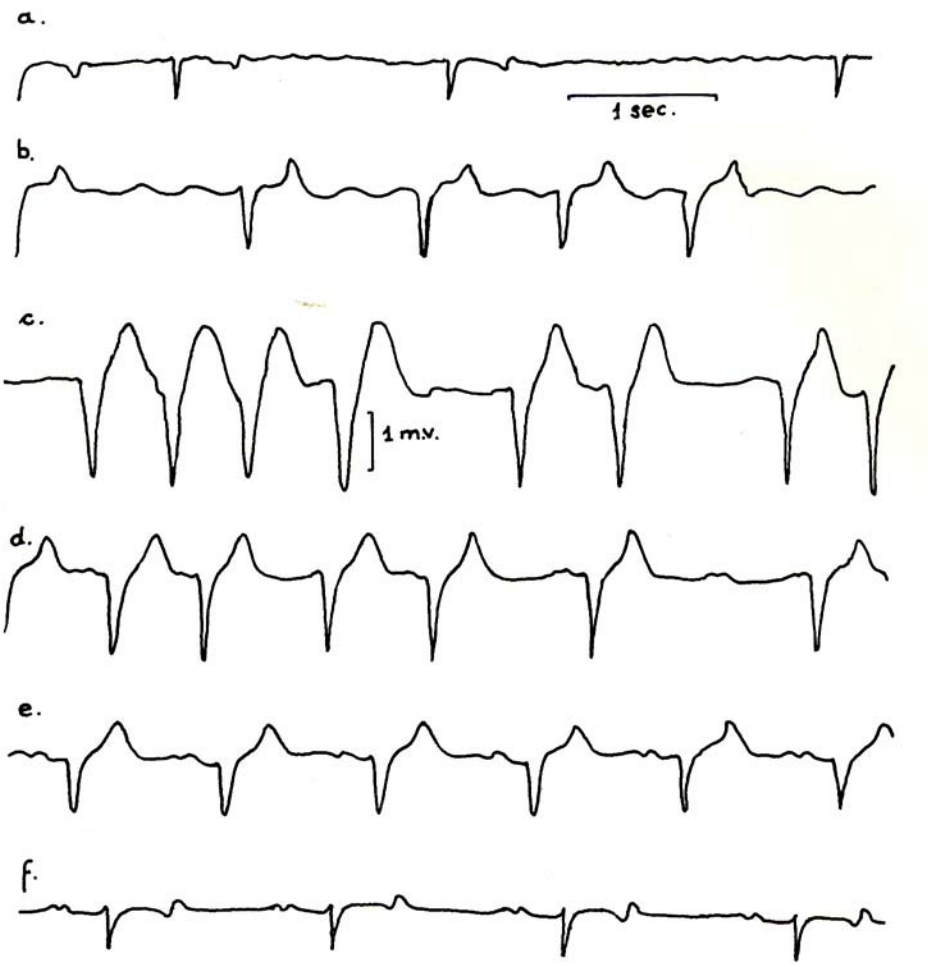


Fig. 2. ECG recordings of case 4 showing the modifications of the rate, form and amplitude of the different waves during treatment
a. start of treatment; b. 1 hour later; c. 2 hours later; d. 3 hours later; e. 4 hours later: cardioversion; f. 24 hours after cardioversion.

## Discussion

The treatment of atrial fibrillation by intravenous perfusion of quinidine under telemetric ECG monitoring presents several advantages: 1. The horse is isolated in its box, free from cumbrous equipment and so remains quiet and unstressed during the whole treatment and there is no risk for the operator; 2. The continuous ECG monitoring provides the ability to observe the first signs of toxicity of the drug and to reduce or stop the perfusion in time. Paroxysmal ventricular tachycardia is a well known complication of quinidine treatment (BINDER and ROSOVE, 1952; WETHERBEE et al., 1952). This problem, observed during our treatment in 2 cases, vanished very quickly after reduction of the rate of administration; 3. Intravenous perfusion under continuous ECG monitoring can be stopped at the exact moment of cardioversion (Fig. 1) and so the risk of overdosage is avoided and the minimal quantity of drug is used, reducing considerably the cost of the treatment and the danger of severe toxicity.

The efficacy of the treatment and the risk of recurrence with this method appear to be similar to those obtained by the traditional treatment. It seems that the more recent the trouble the better the results, without any distinction between forms of treatment.

These conclusions are comparable to those of GERBER et al. (1972) using dihydroquinidine gluconate and of DEEGEN and BUNTENKÖTTER (1974) using quinidine sulphate. Dihydroquinidine is more soluble, more expensive, more active and is said to be more toxic than quinidine (SCOTT et al., 1945) but our results do not show any obvious difference between the 2 drugs, except for the cost of the treatment.

The oral dosage given to horse 7 produced also a rapid cardioversion but this method, recommended by ROSE and DAVIS (1971), seems much more arduous because of the repeated gastric probing.

Since the other methods of atrial defibrillation used in human medicine do not seem possible for adult horses (WITZEL et al., 1968), it is likely that the best form of treatment, the easiest, cheapest, fastest and safest, so far as is known to day, is the intravenous perfusion of quinidine sulphate carried out during continuous ECG monitoring.

## Summary

In view of the disadvantages of the traditional method of atrial defibrillation, three different methods of treatment (intravenous perfusion of quinidine sulphate, intravenous perfusion of dihydroquinidine gluconate and repeated oral administration of quinidine sulphate) were tested in 6 horses (7 attacks) from the point of view of efficacy, quantity of drug required, duration and convenience of the treatment, and toxicity.

The authors conclude that the intravenous perfusion of quinidine sulphate under continuous ECG monitoring seems to be the method of choice for the treatment of atrial fibrillation in the horse.

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## Zusammenfassung

### Vergleich verschiedener Behandlungen beim Vorhofflimmern des Pferdes

In Anbetracht der Nachteile der traditionellen Verfahren zur Vorhofdefibrillation wurden bei 6 Pferden (7 Anfälle) folgende Behandlungsmethoden angewandt: Intravenöse Infusion von Chinidinsulfat, intravenöse Infusion von Dihydrochiningluconat und wiederholte orale Verabreichung von Chinidinsulfat. Überprüfte Kriterien: Wirksamkeit, Dosierung, Dauer und Praktikabilität der Behandlung sowie Toxizität.

Die Autoren betrachten die intravenöse Infusion von Chinidinsulfat unter dauernder EKG-Überwachung als Methode der Wahl zur Behandlung des Vorhofflimmerns beim Pferd.

## Résumé

### Comparaison de différents traitements de la fibrillation auriculaire chez le cheval

Considérant les désavantages de la méthode traditionnelle de défibrillation auriculaire, trois différentes méthodes de traitement (perfusion intra-

veineuse de sulfate de quinidine, perfusion intraveineuse de chlorhydrate de dihydroquinidine et administration orale répétée de sulfate de quinidine) ont été testées chez 6 chevaux (7 attaques) au point de vue efficacité, quantité de médicament requise, durée et commodité du traitement, et toxicité.

Les auteurs concluent que la perfusion intraveineuse de sulfate de quinidine sous monitoring ECG continu semble être la méthode de choix de traitement de la fibrillation auriculaire chez le cheval.


## Resumen

### Comparación de diversos tratamientos de la fibrilación atrial en el caballo

Considerando las desventajas de los métodos tradicionales para la desfibrilación auricular, se emplearon en 6 caballos (7 ataques) los métodos terapéuticos siguientes: infusión intravenosa de sulfato de quinidina, infusión intravenosa de gluconato de dihidroquinina y la administración oral repetida de sulfato de quinidina. Se comprobaron los criterios siguientes: efectividad, dosificación, duración y practicabilidad del tratamiento, amén de la toxicidad.

Los autores consideran la infusión intravenosa de sulfato de quinidina bajo el control permanente como el método de elección para el tratamiento de la fibrilación auricular en el caballo.


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