dumping (Walker *et al.*, 1962; Howe, 1964; Silver *et al.*, 1965; Zeitlin and Smith, 1966).

In two patients raised free plasma kinins were not found during a dumping attack. This is probably due to loss of activity during collection of samples owing to the extremely short half-life of bradykinin in vivo (15 seconds). Our results support the findings of Zeitlin and Smith (1966) and provide further evidence for involvement of kinins during vasomotor dumping in man. The present work shows that there is no significant difference in the fasting venous kininogen after gastric surgery in patients with dumping symptoms and those without. Furthermore, postcibal kinin liberation does not occur in patients who had previously had gastric surgery but who do not experience vasomotor dumping attacks.

One possible mechanism for release of kinins during dumping is based on the findings of Amundsen and Nustad (1965), who showed the presence of kinin forming activity in cell homogenates of the alimentary tract of the rabbit. Subsequently, the relative concentrations of kallikrein at different levels of the gastrointestinal tract of the rat were determined by Zeitlin (1969), who found the intestinal kallikrein activity to be especially high in the duodenum and ileum.

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References

Amundsen, E., and Nustad, K. (1965). *Journal of Physiology*, **179**, 478.
Blumel, G., Klauser, G., Neumayr, A., Peschl, L., and Rettenbacher-Teubner, H. (1967). *Medizinische Welt*, **46**, 2751.
Brocklehurst, W. E., and Zeitlin, I. J. (1967). *Journal of Physiology*, **191**, 417.
Howe, C. T. (1964). *Surgery, Gynecology and Obstetrics*, **119**, 92.
Silver, D., Anlyan, W. G., Postlethwait, R. W., Morgan, C. V., and Mengel, C. E. (1965). *Annals of Surgery*, **161**, 995.
Walker, G. R., Turner, M. D., and Hardy, J. D. (1962). *Surgical Forum*, **13**, 241.
Zeitlin, I. J. (1969). In *Bradykinin and Related Kinins*, ed. F. Sicuturi, M. A. Rocha e Silva, and Nathan Back, p. 329. New York, Plenum Press.
Zeitlin, I. J., and Smith, A. N. (1966). *Lancet*, **2**, 986.

Intramuscular Lignocaine 2% and 10%

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Summary

Studies in 10 male volunteers has shown that intramuscular injection of 10% lignocaine produces similar blood lignocaine levels to those obtained with larger volumes of a less concentrated preparation. Since no local or general complications occurred it is suggested that the 10% solution is suitable for clinical use.

Introduction

The use of lignocaine in the treatment of ventricular arrhythmias is now established. Attention has been drawn to the use of the intramuscular route for prophylaxis or treatment of patients suffering from these arrhythmias, especially in the domiciliary situation (Scott *et al.*, 1968; Bellet *et al.*, 1969). Intramuscular injection might avoid the problems associated with bolus or constant intravenous therapy, especially during transport to hospital. As the highest concentration of lignocaine at present available is 2%, a large volume must be used. A small volume of high concentration injected intramuscularly would have advantages, but it is important to know that these solutions are not unduly toxic and do not cause local muscle damage. The purpose of this study was to compare absorption of 2% and 10% lignocaine in normal people in regard to blood levels and identify systemic effects during absorption. Local effects at the injection site were also compared.

Methods

Ten male volunteers under 35 years (mean weight 84 ± 9 kg) were given injections into the lateral aspect of the thigh on two occasions separated by at least one week. On one occasion 2 ml of 10% solution of lignocaine was used and on the other 10 ml of 2% solution. The lignocaine injection was accompanied by the injection of the same volume of normal saline into the other thigh, the nature of the injections being unknown to the volunteer or experimenter until the code was later broken. Venous samples were taken at 5, 10, 15, 30, 45, 60, 90, 120, 180, and 240 minutes after injection and lignocaine levels were estimated by gas chromatography (Keenaghan, 1968). The E.C.G. was monitored by standard lead II, heart rate was obtained by apical pulse, and blood pressure by sphygmomanometer. Respiratory rate was taken by direct counting. The injection site was examined immediately after injection, at 30 minutes, 4 and 24 hours, and 3 days after injection.

Results

Table I shows mean lignocaine levels in peripheral venous blood as varying with time. Analysis of variance showed no statistical significance between 2% and 10% for subject or time. A significant fall in heart rate from control ($P < 0.01$) occurred with both concentrations over the four-hour experiment. No other changes in cardiac rhythm were observed and no variations in blood pressure or respiration were found. Subjective signs of general toxicity did not occur in any case. Complaints at the time of injection (Table II) disappeared within five minutes of injection and, with the exception of one volunteer who after receiving 2% lignocaine still had bilateral tenderness at the injection site after three days, no local complications were seen. The subjects identified correctly the site of lignocaine injection on only 5 of the 20 occasions.

Discussion

If the range 1-1·5 μg/ml is assumed to be the minimum therapeutic level of lignocaine (Killip, 1968; Harrison and Alderman, 1970), this was not achieved when the mean levels of the two

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TABLE I—*Mean* (± S.D.) *Blood Lignocaine Levels* (μg/ml) *after Injection*

Solution	5 min	10 min	15 min	30 min	45 min	60 min	90 min	120 min	180 min	240 min
2%	0·21 ± 0·24	0·34 ± 0·24	0·59 ± 0·26	0·76 ± 0·39	0·95 ± 0·60	0·67 ± 0·40	0·70 ± 0·50	0·42 ± 0·23	0·28 ± 0·18	0·22 ± 0·25
10%	0·25 ± 0·21	0·46 ± 0·32	0·61 ± 0·39	0·52 ± 0·22	0·61 ± 0·20	0·52 ± 0·12	0·44 ± 0·15	0·34 ± 0·10	0·23 ± 0·05	0·17 ± 0·04

TABLE II—*Number of the 10 Volunteers Complaining on Injection*

Complaints	2% Lignocaine	10 ml NaCl	10% Lignocaine	2 ml NaCl
Fullness, pain, or burning sensation	6	7	2	4

concentrations are considered. Five subjects, however, achieved a blood level in excess of this, the highest being 2·5 μg/ml.

These low mean levels in volunteers, however, contrast with those found on injection under anaesthesia and in studies on patients with myocardial infarction (Scott *et al.*, 1968; Bellet *et al.*, 1969). They are not, however, completely unexpected since another volunteer study involving 2·4 mg/kg into the vastus lateralis showed comparable low blood levels (Meyer and Zelechowski, 1970). The different levels achieved in the "physiological volunteer" as compared with the "non-physiological patient" may be due to variation in cardiac output, muscle perfusion, or other factors influencing the pharmacokinetics of lignocaine. Hepatic blood flow and function may also be altered during these non-physiological states. The range of individual blood levels found in both volunteer and patient studies confirm that, whereas therapeutic levels can often be achieved, accurate blood levels cannot be forecast.

Since, however, a 10% solution is a smaller volume to produce discomfort, achieves similar lignocaine blood levels to a lower concentration, and shows no apparent local complications, it is a suitable concentration for clinical use. It has been held that highly concentrated solutions of local anaesthetics are particularly toxic, but blood level studies have failed to confirm this (Braid and Scott, 1965), as has the present study.

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References

Bellet, S., Roman, L., Kostis, J., and Fleischman, D. (1969). *Circulation*, Suppl. No. 3, p. 43.
Braid, D. P., and Scott, D. B. (1965). *British Journal of Anaesthesia*, **37**, 394
Harrison, D. C., and Alderman, E. L. (1970). In *Lidocaine in Treatment of Ventricular Arrhythmias*, p. 178. Edinburgh, Livingstone.
Keenaghan, J. B. (1968). *Anesthesiology*, **29**, 110.
Killip, T. (1968). *Acute Myocardial Infarction*, p. 106. Edinburgh, Livingstone.
Meyer, M. B., and Zelechowski, K. (1970). In *Lidocaine in Treatment of Ventricular Arrhythmias*, p. 161. Edinburgh, Livingstone.
Scott, D. B., Jebson, P. J., Vellani, C. W., and Julian, D. G. (1968). *Lancet*, **2**, 1209.

Cardiac Beriberi: Two Modes of Presentation

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Summary

Two patients suffering from cardiovascular beriberi presented with different clinical manifestations. One had the classical features of a high cardiac output with raised jugular venous pressure and gross oedema. The other was in fulminating heart failure with clinical evidence of a low cardiac output but no peripheral oedema. The latter type of beriberi (shoshin) is rare. Cardiovascular beriberi has a high mortality when untreated. Both patients responded dramatically to thiamine, and this emphasizes the importance of considering thiamine deficiency as a cause of heart failure even when the cardiac output is low.

Introduction

Beriberi is due to deficiency of thiamine, a vitamin which is a cofactor in a variety of important biochemical reactions (Williams, 1961). It is common in rice-eating communities but occurs sporadically in Western countries where it is usually associated with chronic alcoholism or, more rarely, with dietary faddism. It presents in two major forms in adults —the "dry," in which features of peripheral neuropathy predominate, and the "wet" or cardiac beriberi, in which oedema is prominent. The cardiac form has been recognized for centuries in the Far East and India, but its occurrence in the West has been adequately documented only since 1937, when Weiss and Wilkins established the importance of thiamine deficiency in the production of cardiovascular disturbance in alcoholics.

Cardiac beriberi classically presents as a high output state with raised jugular venous pressure and peripheral oedema (Wood, 1968). Less commonly it presents as fulminating heart failure with evidence of a low cardiac output, and this form has been given the name "shoshin" beriberi. "Sho" in Japanese means acute damage and "shin" means heart (Wolf and Levin, 1960). Only one case has previously been recorded in Britain (Wood, 1939).

We describe here two cases of cardiac beriberi. One presented with clinical evidence of a very low cardiac output; the other had a high cardiac output, and cardiorespiratory studies showed several interesting features. In both cases the response to thiamine was dramatic, emphasizing the importance of recognizing these syndromes.

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