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Glucagon and Ureteric Colic

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Summary. A randomised prospective double-blind study of the effect of 1 mg glucagon intravenously was done on 51 consecutive patients with acute uretic colic. No significant difference between glucagon and placebo could be demonstrated as to pain relief or passage of calculi.

Key words: Glucagon, Ureteric colic, Ureteric calculi, Ureters.

Glucagon is a polypeptide of 29 amino acids, which is secreted by the alpha-cells of the pancreas. Its major function is to stimulate liver glycogenolyses. Furthermore, glucagon is well known to radiologists and gastroenterologists as a smooth muscle relaxant used in certain radiographic and endoscopic examinations of the gastrointestinal tract and in hysterosalpingography [8, 1, 15].

In human subjects small doses of glucagon increase the glomerular filtration rate [11], and in dogs the renal blood flow is raised after glucagon administration [13, 14]. Glucagon also causes relaxation of the ureters in dogs [3]. However, in human subjects it fails as a pharmacological alternative to abdominal compression during intravenous urography [10]. The antispasmodic effect of glucagon on the ureters has been postulated to cause faster passage of ureteric calculi and to reduce pain during ureteric colic [7, 9]. This study was undertaken to examine these two possible effects.

Materials and Methods

The study was designed as a prospective consecutive double-blind trial, and all patients with ureteric colic who were admitted to our department from 15. 1. 1980 to 15. 1. 1982 were included in the study (Table 1). Patients were excluded if they had a) phaeocromocytoma, b) insulin-dependent diabetes, or c) such severe pain that it was necessary to administer morphine.

Informed consent for the trial was obtained from the patients, and all of them had excretory urography performed with amidotrizoate 76% (Urografin 76%) 60 ml given intravenously. Radiographs were taken 3, 7, and 15 min post injection and later, if necessary.

Table 1. Sex and age of patients in glucagon and placebo groups

	Number	♂	♀	Average age
Glucagon	26	21	5	50,5
Placebo	25	19	6	45,9
Total	51	40	11	

After the ureter had been seen down to the calculus 1 mg of glucagon/placebo was given intravenously, and because of the differences which had elapsed in the time from contrast injection to the glucagon/placebo injection a further 40 ml of amidotrizoate was given in order to eliminate errors due to differences in the diuretic effect of the contrast medium itself.

No patients were given analgesics more than $3\frac{1}{2}$ h before glucagon/placebo injection. Twenty min after the glucagon/placebo administration patients were asked whether the pains had decreased, increased or remained unchanged. Radiographs were taken 20 min, 1 h, 6 h, and 24 h after the glucagon/placebo injection to monitor the position of the calculi, and the time until morphine injection was necessary was noted. At the end of the study all radiographs were inspected and analysed blindly.

Results

Pain

Thirteen patients had no or only weak pains before the glucagon/placebo injection. The results of the remaining 38 patients are seen in Table 2. There was no significant difference between the two groups. The time with pain relief varied in both groups from 0 to more than 24 h. Statistically tested by the Mann-Whitney test there was no significant difference between the glucagon and the placebo group. The mean time of pain relief for all 51 patients was 14.6 h in the glucagon group and 14.9 in the placebo group (24 h was the maximum that could be included). The number of patients who did not need analgesics in 4 h or more is seen in Table 3, and there is no significant difference between the two groups.

Table 2. The effect of glucagon on pain

	Relief	Unaffected	Total
Glucagon	8	13	21
Placebo	8	9	17
Total	16	22	38

Table 3. Number of patients who needed analgesics before 4 h after glucagon/placebo injection

	Pain relief		
	< 4 h	⩾ 4 h	Total
Glucagon	10	16	26
Placebo	7	18	25
Total	17	34	51

Table 4. Number of calculi that moved after injection of glucagon/placebo

	Moved	Unaffected	Total
Glucagon	8	18	26
Placebo	7	18	25
Total	15	36	51

Table 5. Number of calculi ⩽ 4 mm in diameter that moved after injection of glucagon/placebo

	Moved	Unaffected	Total
Glucagon	7	7	14
Placebo	5	11	16
Total	12	18	30

Calculi

Fifteen calculi moved within the first 24 h, and of these 7 passed spontaneously. The distribution of the two groups is seen in Table 4. In Table 5 only calculi with a diameter of 4 mm or less are included; however, no significant differences were noted.

Discussion

In recent years efforts have been made to find alternative drugs to morphine in the treatment of ureteric colic. Sterile water injections have been shown to have some effect on the pain [2]. Holmlund has shown that the ureteric colic is produced primarily by the oedema of the wall and therefore spasmolytic drugs such as papaverine have no effect [4, 5]. He also found that calculi smaller than 4 mm in diameter passed spontaneously within 2 days more often when oxyphenbutazon was administered [5]. Furthermore it has been shown that indomethacin has an analgesic effect on ureteric colic [6, 12].

In our study we found no effect on the pains of a single injection of 1 mg of glucagon; neither was the movement of calculi enhanced. These results correspond well to those found with papaverine, and to the theory that oedema and not peristaltic waves cause ureteric colic, but are contradictory to the positive results of the effect of glucagon on ureteric colic [7, 9]. The injection of amidotrizoate might have blurred the effect of glucagon on pain in our study; however, if so, the effect must have been very weak.

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