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Medical treatment of infantile hypertrophic pyloric stenosis: should we always slice the "olive"?

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Abstract

Background/Purpose: Laparoscopic pyloromyotomy has recently gained wide acceptance as the optimum treatment of infantile hypertrophic pyloric stenosis (IHPS). However, medical treatment may be superior to laparoscopic surgery in invasiveness. The efficacy of our regimen of intravenous atropine therapy for IHPS was assessed in comparison with surgical treatment.

Methods: Medical treatment was initially chosen for 52 (61%) of 85 infants with IHPS at our institute between 1996 and 2004. Atropine was given intravenously at 0.01 mg/kg 6 times a day before feeding. When vomiting ceased and the infants were able to ingest 150 mL/kg per day of formula after stepwise increases in the feeding volume, they were given 0.02 mg/kg atropine 6 times a day orally, and the dose was decreased stepwise.

Results: Of the 52 patients, 45 (87%) ceased projectile vomiting with treatment using intravenous (median, 7 days) and subsequent oral (median, 44 days) atropine administration. The median hospital stay was 13 days (6-36), and no significant complications were encountered during atropine therapy. The remaining 7 patients required surgery. Of 40 who underwent surgery, 4 had wound infections and 1 with hemophilia had postoperative hemorrhagic shock. The patients who underwent successful atropine therapy had body weights comparable with those who underwent surgery at the age of 1 year.

Conclusions: The high success rate of intravenous atropine therapy for IHPS suggests that this therapy is an effective alternative to pyloromyotomy if the length of the hospital stay and the necessity of continuing oral atropine medication are accepted.

Fredet-Ramstedt pyloromyotomy is the optimal treatment of infantile hypertrophic pyloric stenosis (IHPS) [1]. With technological advances and the general increase in popularity of laparoscopic surgery even for small children, laparoscopic pyloromyotomy has come into vogue mainly in western countries [2]. However, its efficacy and benefits remain unclarified in comparison with the conventional open procedure [3]. On the other hand, the outcome was poor without surgical intervention for this condition because

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atropine given orally does not work consistently in infants with frequent projectile vomiting. However, recent studies regarding intravenous atropine therapy have shown significant success rates [4-6]. The current study assessed the efficacy and safety of our regimen of intravenous atropine therapy for IHPS in comparison with surgery.

1. Patients and methods

1.1. Patients

Since the introduction of intravenous atropine therapy in 1996, 87 patients with IHPS were treated at the Osaka Medical Center and Research Institute for Maternal and Child Health during the last 9 years. The diagnostic criteria for IHPS were as follows:

1. Repeated projectile vomiting more than twice a day.
2. Pyloric canal length ≥15 mm and pyloric muscle thickening ≥4 mm on ultrasonography.

When the measurement of pyloric hypertrophy was close to but did not fulfill the criteria, fluoroscopy was conducted, and patients were diagnosed with IHPS when characteristic string or umbrella signs were observed. Two patients who were subsequently diagnosed with associated malrotation or sliding hiatal hernia, respectively, were excluded from the study. The method of treatment of IHPS, medical or surgical, was determined according to the informed choice of the patients' guardians after ample explanation of each treatment, except for 1 patient. Medical treatment was chosen for a patient with an anorectal anomaly because surgery was difficult owing to his colostomy. Medical treatment with intravenous atropine therapy was initially chosen for 52 patients (61%). The remaining 33 patients chose surgery as the initial treatment at our hospital. Of them, 10 had undergone unsuccessful intravenous or oral atropine therapy before being referred to our hospital. The atropine therapy regimens for these patients were different from ours. Surgery was performed with pyloromyotomy using 2 surgical procedures: the supraumbilical skin-fold incision and the right upper quadrant incision. Before surgical and medical treatment, peripheral blood cell counts, electrolytes, and biochemical examination were conducted as a routine, whereas a coagulation test was not included in the routine test.

1.2. Treatment regimen for intravenous atropine therapy

The details of the regimen of intravenous atropine therapy were reported previously [5]. Atropine was intravenously administered at 0.01 mg/kg 6 times a day, 5 minutes before feeding. During atropine infusion, the heart rate was continuously monitored with electrocardiography. Oral feeding was started at 10-mL formula, 6 times a day. The volume was increased day by day until each patient tolerated 150 mL/kg per day, unless vomiting occurred more than twice a day. When the patient was able to tolerate the full volume of formula without vomiting more than twice a day, 0.02 mg/kg atropine was orally administered 6 times a day before feeding. Patients with IHPS who did not respond to the medical treatment underwent open pyloromyotomy. The patients who underwent successful medical treatment were discharged when their vomiting was controllable with oral atropine. When a patient was free of vomiting and showed steady weight gain, atropine was decreased in 3 steps of 0.12, 0.06, and 0.03 mg/kg per day. If the patient vomited more than twice a day for 3 days after the discontinuation of atropine therapy, oral administration was recommenced.

1.3. Follow-up

The guardians of patients who were treated with atropine therapy or surgery were asked for permission to review the patient at the age of 1 year. The clinical condition and body weight were recorded in medical charts, and weights were converted into SD scores using data from Japanese infants published in the national survey of 1990 (Ministry of Health and Welfare, Japan).

1.4. Statistical analysis

All data are presented as median values and ranges. Tests for significant differences were analyzed using the Mann-Whitney U test unless otherwise specified. Data on the hospital stays of 4 patients who were admitted owing to other pathological conditions since birth were excluded when analyzed.

2. Results

Intravenous atropine therapy was chosen for 52 patients with IHPS with a median age of 40 (10-132) days. Their median body weights were 2981 (626-4430) g at birth and 3730 (2323-5410) g at the time of presentation. Among them, 45 (87%), including 1 with colostomy, were successfully treated with our atropine therapy regimen. The details of those who were successfully and unsuccessfully treated with atropine therapy are shown in Table 1. Body weight at the time of presentation was significantly different between the 2 groups (P = .04). The durations of subsequent oral atropine administration and total atropine therapy were 44 (23-128) days and 51 (29-137) days, respectively. Significant complications were not encountered during therapy. Urinary tract infection, upper respiratory tract infection, and a transient increase in serum aspartate aminotransferase were observed in 1 patient each.

In total, 40 patients, including 7 who had received unsuccessful atropine therapy at our hospital, underwent surgery at the median age of 42 (17-135) days. Their median body weight was 3085 (1414-3838) g at birth and