SUBTOTAL PANCREATECTOMY FOR PERSISTENT HYPERINSULINEMIA HYPOGLYCEMIA IN NEONATE (A CASE REPORT)

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ABSTRACT

Persistent hyperinsulinemic hypoglycemia of infancy (PHHI) is rare condition of inappropriate and excessive insulin secretion from & beta; cell hyperplasia of pancreas. The incidence in general population is 1 : 50,000 live birth. The refractory hypoglycemia may produce brain damage unless effective treatment at an early stage. The mainstay of medical treatment includes increasing carbohydrate intake feeds or intravenous glucose at a rate above 15 mg/kg bw/minute and octreotide. If these measures fail surgical resection should be considered. We reported the difficulty of management a case with diagnosis of PHHI. NS, 12 days of age female, 4,200 gram from Sidoarjo was referred to Dr Soetomo Hospital with diagnosis of refractory hypoglycemia. She suffered from seizures, 3 times of apnea, and several hypoglycemia episodes. She had received some medication includes several boluses of 40% of dextrose solution, 10% of dextrose infusion, Dexamethazone, and antibiotic. She was born spontaneously with the body weight of 4000 gram, and head circumference of 33 cm. There was no history of diabetic mother. In our hospital, we treated her with high rate of glucose infusion about 15 mg/kgbw/minute, frequent feeding (via oral and nasogastric tube). Up to day 6 of hospitalization the episodes of hypoglycemia still persisted, the treatment added with octreotide 8 μg/kgbw/day in divided doses. The hypoglycemia episodes disappeared after that. She was performed of Abdominal USG and CT Scan that indicated of tumor of corpus pancreas. The laboratory examination revealed: very high result of C-peptide (3.3 ng/l) with no keton body. She was performed subtotal pancreatectomy 95% one month later, because of social judgement. And the histological examination revealed of diffuse pancreatic beta cell hyperplasia. The several hyperglycemia episodes were occurred until 4 days after operation, and insulin was given if the blood glucose & gt; 110 mg/dl. The baby was discharge d on day 66 of hospitalization (78 day of age) with normal blood glucose level, and head circumference of 34 cm (microcephali). On the follow-up examination (7 months of age), she was in a good condition with no symptom of hypo or hyperglycemia, and normal blood glucose level. The head circumference was 42 cm.

Keywords: *hypoglycemia, pancreatectomy*

INTRODUCTION

Persistent hypoglycemia usually means hypoglycemia persisting or recurring over a period > 7 days. Hyperinsulinism is the most common cause of persistent or recurrent hypoglycaemia in infancy, it is a major cause of neurological damage and life long handicap. It is commonly named as PHHI, which is characterized by unregulated insulin release, leading to profound hypoglycemia with a major risk of brain damage if not recognized early (Ansley A, 2000; Otonski T, 1993; Sully RE et al, 2001).

The syndrome of persistent hyperinsulinaemic hypoglycemia of infancy (PHHI) was described more than 40 years ago by Mc Quarrie (Rahier J, 2000) The occurrence of PHHI is low in the Western world (~1/50,000 live births), but it can be as high as 1/2,500 live births in communities with high consanguinity (Ansley A, 2000). The diagnosis of PHHI must be considered in any infant with refractory hypoglycaemia. Early diagnosis and appropriate treatment is imperative to prevent hypoglycaemic injury to the neonatal brain (Cresto JC, 1998). The purpose of this case reports was to describe the complexity in management infants with persistent hyperinsulinemic hypoglycemia.

CASE REPORT

NS, 14th day old girl, was referred to Dr. Soetomo hospital because of refractory hypoglycemia. She was hospitalized at Siti Hajar Hospital for 12 days. She was born by spontaneous delivery in her own house helped by midwife with the body weight 3950 g, body length 52 cm, head circumference 33 cm, and normal Apgar

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score. There was history of turbid amniotic fluid, with 4 hours premature rupture of the membrane. The mother, 21 years old, had no history of diabetes mellitus nor took any medicine. The father, 28 years old, works as an employee of chemical factory.

NS was the second child, the first baby died in 12 days with unknown cause of death. First day after birth, she refused to suck and look weak, then their parents brought her to Siti Hajar Hospital. The level of blood glucose was 41 mg/dl. At there, she assessed as a term neonate, large for gestational age, and hypoglycemia. She was given iv line with D10% 240 ml/24 h, Cefotaxim 3 x 100 mg iv, Dexamethason 3 x ¼ ampoule, Sodium bicarbonate 2 cc, Vitamin K 2 mg im, and Extra D40% 2 ml iv slowly. Laboratory examination revealed hemoglobin 18.6 g/dl, leukocyte 22.900/mm3, platelets 203.000/mm3.

During hospitalization, her blood glucose level was up and down (with the range between below 20 ml/dl until 349 ml/dl with Dextrostix), and she got apnea three times during 12 days hospitalization.
At 12th day of live, she was transferred to Dr. Soetomo Hospital. When she came to our hospital, she looked well, cried loudly, good activity, with the body weight 4200 g, heart rate 144 beats/minute, respiratory rate 36 breaths/minute regularly, axillary temperature 37.5°C. Head and neck was normal, chest was normal, hearts and lungs were normal. Abdominal examination was normal too.

Laboratory examination revealed Hb 16.3 g/dl, leukocyte 56.00 mm3, platelets 432,000 mm^3, and blood glucose levels 86 mg/dl. The baby was assessed as term neonate with large for gestational age, suspected of bacterial infection, and symptomatic hypoglycemia. The initial treatment consisted of iv line D10% 500ml/24h, breast feeding or formula's milk on demand, Ampicillin 3 x 150 mg iv, and thermoregulation.

From day 1 until 6 of hospitalization, her blood glucose levels still up and down (with the range between below 20 mg/dl until 250 mg/dl), when the iv line had trouble and stopped for a while, her blood glucose levels always drop very low, so she was very dependent with iv line. Abdominal USG was performed and revealed of corpus pancreatic tumor, and the radiologist suggested continuing with abdominal CT scan. C-peptide examination revealed 1,0293 nmol/L (mean normal value was 0,12; which ranged between 0,03 – 0,24). Urinary examination revealed no keton bodies. The assessment was changed with term neonate, large for gestational age, and persistent hypoglycemia caused by tumor of corpus pancreas. At day 9 of hospitalization, she started given Octreotide 8 ug/kg bw/day in fourth divided doses, the hypoglycemia episodes decreased after that. Abdominal CT-scan revealed a mass on corpus pancreas.

She was finally planned to undergo subtotal pancreatectomy. During one-month period for waiting the operation, we must maintain the blood glucose levels in normal range, when she was 53 days old, the operation was performed. The operation found a soft solid mass with the diameters of approximately 2 cm in corpus area of the pancreas. When try to released bursa omentalis tied to mesocolon transversum in the vascular area and become ischaemic, then resection of colon transversum approximately 5 cm must be done, then continued to colotransversalectomy. Subtotal pancreatectomy was done, and this tissue referred to anatomic pathology department to be examined.

After the operation, the octreotide was stopped, and she was planned to give insulin with the rule of:
1. If blood glucose levels < 110 mg/dl: not necessary to give insulin,
2. If blood glucose levels between 110 – 250 mg/dl: give insulin 0.02 unit (0.05 cc),
3. If blood glucose levels > 250 mg/dl : give insulin 0,04 unit (0.1 cc).

The decrease of blood glucose level was not allowed >100 mg/dl, gived Cefotaxim 3 x 150 mg iv, temporary fasting, monitoring urine production and urine colour.

First day after operation, the baby was in stable condition, operation wound was good, and colostomy was also good, without any sign and symptom of bleeding. Blood glucose levels was 140-180 with Dextrostix, and the planning of diagnose and therapy for this day was check blood glucose levels every our until stable, complete blood analysis, electrolyte serum, albumin serum, and C-peptide. The therapy was give infusion of D10 0.18 S 800ml/24h, Cefotaxim 3 x 150 mg iv, Novalgin 3 x ¼ ampoule iv, the rule of giving insulin still the same, took care for operation wound, and temporary fasting. Laboratory examination revealed hemoglobin 15.7 g/dl, leukocyte 35,600 x 106/L, blood glucose levels 335 mg/dl, Sodium 4.55, Potassium 130, Chloride 105. C-peptide examination revealed 8.2 ng/ml (mean normal value was 0.12; N: 0.03 – 0.24).

At day 3 after operation, the baby was planned to transfer to Neonatal Intensive Care Unit, we planned to check blood glucose levels every 2 hours and fecal analysis. The blood glucose levels before transfer was 193 mg/dl. The therapy was D10 0.18S infusion 720

ml/24h, still give insulin with the same rule, formula milk 12 x 10 cc, plasma 45 cc for three days, and if fecal analysis showed many bacteria and leukocyte > 4-5 antibiotics the therapy was added with Cephalexin.

At day 4 after operation, she got greenish vomiting, but still in a stable condition. Check for blood glucose levels every 2 hours was still planned, still give insulin with the same rule. D10 0,18S infusion 555 ml/24h, formula milk (Pregestimil) 12 x 15 cc, Cefotaxim 3 x 150 mg iv, Cephalexin 3 x 45 mg orally, KCl 3% 3 x cth I orally. Head circumference was examined because there was suspicion of microcephali, checked for T3, FT4, and TSHS, Cortisol, and head CT scan.

At day 6 after operation, the infusion tried to stop, Pregestimil 8 x 80 cc, Cefotaxim injection stopped, Cephalexin 3 x 45 mg orally, Cobazym 4 x 1/8 tablets. Day after day, when the infusion was tried to be stopped, hypoglycemia sometime occur, and the infusion must be given again. This condition happened several times. Insulin sometimes added to the therapy. Laboratory examination revealed T3 160 (N: 86 – 187 ng/dl), FT4 2,1 (N: 0.8 – 2.1 ng/dl), TSH-S 0.25 (euthyroid : 0.15 – 5.0 uIU/ml), Cortisol 400 (N: 160 – 660 nmol/L). Head CT-scan revealed microcephali and brain atrophy. At day 25 after operation, when she was 74 days old, the baby was discharged from the hospital with stable condition.

Five months after operation, the baby was in stable condition, she was able to head up and prone position, with the body weight 8600 g, and head circumference was 38 cm (below –2 of SD), but she still use nasogastric tube for feeding because she still refusal to suck.

DISCUSSION

The diagnosis of neonatal hypoglycemia has been highly controversial. Hypoglycemia in term infants has been defined as a blood glucose value of less than 2.0 mmol/L (<35 mg/dL) or as a plasma glucose value of less than 2.2 mmol/L (<40 mg/dL). However, a recent survey of pediatricians in the United Kingdom demonstrated no consensus as to the level of blood glucose that they considered "hypoglycemia". They cited concentrations ranging from 1 mmol/L (20 mg/dL) to 4 mmol/L (70 mg/dL) as the lower limit of normal. Further, definitions of hypoglycemia are based primarily on population studies of blood or plasma glucose concentrations during the first 48 to 72 hours of life, with hypoglycemia being defined as blood glucose level more than 2 standard deviations below the population mean. Such definitions have only limited physiologic significance (McGowan JE, 1999; Klaus NH and Fanaroff AA, 1996).

Hypoglycemia in newborn is often asymptomatic but can cause jitteriness or convulsions, apathy, hypotonia, refusal to suck, apnea, congestive heart failure, or cyanosis, high-pitched cry or abnormal eye movements, or temperature instability with hypothermia (Klaus NH and Fanaroff AA, 1996).

Our baby, NS 14th days old girl, 4200 g referred to Dr. Soetomo Hospital because of refractory hypoglycemia which was occurred at the first day of her live, from physical examination she looked apathy and refusal to suck, and blood glucose levels when she firstly coming to that hospital was 40 mg/dL. She was hospitalized at Siti Hajar Hospital, for 12 days. During hospitalization on Siti Hajar Hospital, her blood glucose levels were up and down (from below 20 mg/dl until 349 mg/dl with Dextrostix), and she was suffered for apnea for 3 times there. She was treated to overcome the symptomatic hypoglycemia, but the hypoglycemia still persisted so she was transferred to our hospital for further investigation. From the first day until six day later, her blood glucose levels still up and down between below 20 until 250 mg/dl; and when the iv line had trouble and stopped for a while, her blood glucose levels always drop very low, so she was very dependent with iv line.

According to Tricia Lacy, et all, if hypoglycemia persist, give minibolus infusion of 2 ml/kg 10% glucose at a rate of 1.0 ml/min. Then give a continuous infusion of glucose at a rate of 6-8 mg/kg/min, and increase the rate as needed to maintain normal blood glucose (>40-50 mg/dl). The level should be followed every 30-60 min until stable. If hypoglycemia still persists, continue administration of intravenous glucose, until the rate 16-20 mg/kg/min (Gomella TL et al, 1999; Fanaroff AA, 1986).

Hypoglycemia that persists for more than 5 to 7 days is uncommon and most often is due to hyperinsulinism. Several types of congenital hyperinsulinism have been described and are said to be the most common cause of hypoglycemia persisting beyond the first week of life. These patients have been characterized as having "persistent hyperinsulinaemic hypoglycaemia of infancy" (PHHI) (Cresto JC, 1998).

Table 1. Causes of recurrent or persistent hypoglycemia (Gomella TL et al, 1999)

No.	Causes	Disease
1.	Hormone excess hyperinsulinism	Beckwith-Wiedemann syndrome Islet cell adenoma Adenomatosis Beta cell hyperplasia or dysplasia Nesidioblastosis
2.	Hormone deficiencies	Growth hormone deficiency Corticotropin (ACTH) unresponsiveness Thyroid deficiency Epinephrine deficiency Glucagon deficiency Hypoplastic pituitary or aplasia of the anterior pituitary Congenital optic nerve hypoplasia Hypothalamic hormone deficiencies Midline central nervous system malformations
3.	Hereditary defects in carbohydrate metabolism	Glycogen storage disease type I Fructose intolerance Galactosemia Glycogen synthase deficiency
4.	Hereditary defects in amino acid metabolism	Maple syrup urine disease Propionic academia Methylmalonic academia Tyrosinosis 3-hydroxy-3-methylglutaryl-Co A lyase deficiency
5.	Hereditary defects in fatty acid metabolism	Medium- and long-chain deficiency

Table 2. Major causes of persistent neonatal hyperinsulinism

Islet-cell adenoma
Focal beta-cell hyperplasia
Loss of maternal chromosome 11p15 and possibly a paternal mutation
Other
Diffuse hyperplasia (nesidioblastosis)
Autosomal dominant
Mutation in the gene for glucokinase or glutamate dehydrogenase
Other mutations
Autosomal recessive
SUR1, Kir6.2
Other (Sully RE et al, 2001)

The diagnosis of PHHI is usually made following recurrent hypoglycaemic episodes that occur after a short period of fasting in a child who otherwise appears normal. A low blood sugar associated with inappropriately high C-peptide, and low free fatty acids and 3-hydroxybutyrate concentrations; also absence of keton urine confirms the diagnosis. The requirement of a high glucose infusion rate to control hypoglycaemia is also characteristic (Cresto JC, 1998; Fanaroff AA, 1986).

Table 3. The diagnostic criteria for hyperinsulinism

Glucose requirements > 6–8 mg/kg/min to maintain blood glucose above 2.6–3 mmol/litre
Laboratory blood glucose < 2.6 mmol/litre
Detectable insulin at the point of hypoglycaemia with raised C peptide
Inappropriately low blood free fatty acid and ketone body concentrations at the time of hypoglycaemia
Glycaemic response after the adminstration of glucagon when hypoglycaemic
Absence of ketonuria (Ansley A, 2000)

In our case, this baby was checked for keton bodies and C-peptide to determine the cause of persistent hypoglycemia. Keton urine was negative. C-peptide examination revealed 1.09 nmol/liter, normal value was 0.12 (0.03 – 0.24), this finding supported hyperinsulinemic cause of hypoglycemia, so the diagnosis changed by persistent hyperinsulinaemic hypoglycemia, the requirement of high glucose rate to control hypoglycemia in this baby also support the diagnosis. In our case, to determine the cause of this persistent neonatal hyperinsulinaemic, the baby was performed to do abdominal USG followed by abdominal CT-scan, and the result was a mass on corpus of pancreas.

It is important at the outset to identify the objectives of management. They are to: (1) prevent hypoglycaemic brain damage and allow normal psychomotor development; (2) establish normal feed volume, content, and frequency for the age of the child; (3) ensure normal tolerance to fasting for age without developing hypoglycaemia; and (4) maintain family integrity. A regimen cannot be said to be successful if it does not fulfill these objectives. However, in practice it might be very difficult to achieve them. The mainstay of initial medical treatment is the provision of adequate carbohydrate to maintain blood glucose concentrations above 2.6– 3.0 mmol/litre (40-50 mg/dl). Very high infusion rates of glucose (> 20 mg/kg/min) in addition to frequent enteral feeds may be required. This might demand the insertion of a central venous catheter to allow the administration of glucose in high concentrations, together with a nasogastric feeding tube for regular feeds (Ansley A, 2000)

In our case, there was several problems happens, to maintain the blood glucose levels was not easy work, the iv line sometimes stopped, when the infusion stopped for a while, the blood glucose levels dropped very severe, and she become jittery or sweating, or look very pale. When we try to give more feeding, she was vomiting. So the regimen was not successfully.
When the blood glucose concentration has been stabilized, pharmacological agents need to be introduced to try to decrease insulin secretion and normalize the carbohydrate intake. The impact of their introduction can be tested by the definition of a change in glucose requirement. The drugs of first choice are those that can be given orally, because some children may respond very well, even if they require ongoing treatment for several months or years (Ansley A, 2000).

Diazoxide (10–20 mg/kg/day in two to three divided doses) and chlorothiazide (7–10 mg/ kg/day in two divided doses) are recommended for initial treatment and should always be given together. Both these agents activate potassium channels by different mechanisms, the diuretic also being given concurrently for its ability to overcome the fluid retaining effects of Diazoxide. There is controversy over the frequency with which

infants respond fully to these drugs, with reports ranging from 15% to 60%, or more (Ansley A, 2000). In our case, Diazoxide was not given to her because this drug was not available, beside that this drug caused fluid retaining, and the use of this drug in infants also still in controversy.

Second line agents are those that need to be given by infusion or injection. Ideally, they should be given when the orally administered drugs have been shown not to be effective, particularly if the child remains glucose infusion dependent. In practice, however, there may be compelling reasons to begin them because of the enormity of the management problems in controlling the hypoglycaemia. The two most important substances are glucagon and somatostatin (Ansley A, 2000)

Glucagon has a powerful effect on mobilizing glucose from hepatic glycogen. Its administration by means of a continuous intravenous infusion at rates of between 5 and 10 µg/kg/hour can help reduce the infusion rate of glucose needed to maintain normoglycaemia. Some authorities recommend its early use to gain rapid stabilization of blood glucose concentrations; others argue that it is a powerful insulin secretagogue, and its administration in theory will maintain a drive to insulin hypersecretion. For this reason, they propose using Glucagon only with the concurrent administration of somatostatin (Ansley A, 2000). Unfortunately, this drug also could not be given because not available.

The somatostatin analogue, octreotide, activates potassium channels in the cell membrane, and may also affect the intracellular translocation of calcium. The doses proposed for initiating combination treatment are 1.0 µg/kg/hour of Glucagon together with 10 µg/kg/day of Octreotide. It should be noted that these doses are less than those advocated for single hormone infusion. Further systematic research is needed to define the effects and role of these powerful hormones (Ansley A, 2000)

In our case, hypoglycemia still persisting and recurring over a period > 7 days, so she start giving Octreotide 8 ug/kgbw/day in fourth divided doses, thus the hypoglycemia episodes decreased after that. Octreotide, synthetic analogue of somatostatin, inhibit insulin secretion through hyperpolarization of beta cells, and these agents have been used with some success (Ansley A, 2000; Kane C et al, 1997; Hirsch HJ, 1997; Glaser et al, 1993).

After giving Octreotide, the episode of hypoglycemia decreased, but not disappeared et all; several literature said that children who fail to respond to medical treatment should be managed in a centre where there is the closest of collaboration and dialogue between the medical and surgical teams. Some experts recommend that aggressive medical treatment should be continued for at least four to six weeks in early onset hyperinsulinism, but until now it remain unclear. Hypoglycaemia must be prevented during this period, through a combination of high carbohydrate administration rates and drugs.

The criteria for successful medical management are a feeding regimen acceptable to the family, with normal blood glucose concentrations during reasonable periods of fasting. If an acceptable regimen for home oral feeding cannot be established without hypoglycaemia, a surgical approach to management should be considered (Ansley A, 2000) Because of the risk of major management related complications, including central line sepsis, venous thrombosis, hepatic dysfunction, bleeding diatheses, impaired nutrition, and hypoglycaemic encephalopathy, the consensus view expressed by the workshop was that children should be subjected to surgery sooner rather than later (Ansley A, 2000)

The absolute indications for surgery are: (1) demonstration of focal hyperplasia in children unresponsive to medical treatment; and (2) glucose infusion dependency despite maximum doses of diazoxide, chlorothiazide, nifedipine, glucagon, and somatostatin. Infants with diffuse disease will normally require a 95% pancreatectomy to control the hyperinsulinism (Ansley A, 2000).

Our baby was performed subtotal pancreatectomy because of some reasons, first she still cannot given feeding orally without episode of hypoglycemia, beside that was the financial problem, her father is not be able to buy octreotide for so long time, its too expensive for him, the third was the episode of hypoglycemia still happens sometimes, although she was given octreotide properly, sometimes she still need glucose infusion. So, she prepared to underwent subtotal pancreatectomy.

The histological examination of pancreas tissue from the department of anatomic pathology was diffuse pancreatic beta cell hyperplasia. Surgical removal of the pancreatic segment with hyperplastic islets is curative in patients with focal lesions, but those with diffuse hyperplasia require almost total pancreatectomy. It is difficult to differentiate the focal form of hyperplasia from the diffuse form. Pancreatic arteriography and transhepatic venous sampling, although invasive, may

be useful for the detection of localized lesions. Dynamic spiral CT is valuable for the diagnosis of adenomas in adults but has not been tested in infants and young children. The area of abnormal pancreas is usually not macroscopically apparent at surgery and their resection requires skilled microdissection aided by immediate histological examination of the resected tissue. Confirmation of the histological diagnosis is by frozen section, the distinction between focal and diffuse forms being made on the basis of nuclear size and nuclear crowding (Ansley A, 2000).

Ideally, during the operation, we must do frozen section to decide whether partial or subtotal pancreatectomy must be done for our patient. This procedure did not do because some difficulty on the operation technique, this operation was firstly done in Dr. Soetomo Hospital, as mentioned before, and this was very rare case. Persistent hyperinsulinemic hypoglycemia is rare in the general population. The autosomal recessive form, however, can occur as frequently as once per 2675 persons in populations with high rates of consanguinity. The gene for this disorder is on the short arm of chromosome 11 (11p14 –15.1). Multiple mutations within the gene for sulfonylurea receptor 1 (*SUR1*) have been identified. Mutations in the *Kir6.2* gene also cause persistent hyperinsulinemic hypoglycemia. Patients with mutations of either gene have a poor response to treatment with diazoxide (Sully RE et al, 2001) It was likely our baby had this disorders but unfortunately we did not do further investigation because the testing for it was very expensive.

This infant had persistent hyperinsulinemic hypoglycemia, which was initially manifested immediately after birth. The severity of the disease and its unresponsiveness to medical treatment point to diffuse beta cell hyperplasia as the cause. The recent identification of the specific molecular abnormalities linked to focal and diffuse hyperplasia has paved the way for noninvasive diagnostic studies of persistent hyperinsulinemic hypoglycemia, making genetic testing as important as traditional invasive studies (Ansley A, 2000)

Several conditions can happen after the operation:
1. Early postoperative glucose intolerance
2. Postoperative diabetes
3. Postoperative pancreatic exocrine insufficiency

Foregut dysmotility and gastro-oesophageal reflux is common in hyperinsulinism. The pathophysiology is yet to be determined. Infants may show poor sucking and swallowing, retching, vomiting, and intestinal dilatation; feeding problems are compounded by the use of nasogastric or gastrostomy feeds, which delays the establishment of normal feeding patterns, taste, and "orality". In severe cases, the deprivation of oral stimulation may require months of rehabilitation with skilled speech and language therapists (Ansley A, 2000). On this baby, feeding management was tried to start as soon as possible, but until now there was some problem to feeding her. She was still did not want to suck, and her parent having some trouble to give formula milk orally with spoon. So until now she was still using nasogastric tube.

It is unfortunate that so many infants with hyperinsulinism develop evidence of neurological damage, ranging from the subtle to the severe. Careful repeated documentation of neurological status is mandatory; this might require expert paediatric neurological investigation, including magnetic resonance imaging and management of complex disabilities (Ansley A, 2000)

Two extensive reviews of the literature on surgical resection for PHHI spanning the years 1934–76 and 1977–87 have addressed the controversy about the extent of pancreatectomy. The first review showed an overall mortality rate of 10% and an incidence of 54% mental retardation in survivors. Eighteen percent of patients undergoing < 90% pancreatic resection required further pancreatic resection. In the second series of 165 neonates, one quarter underwent 95–98% pancreatectomy with a mortality of 2.4% (one death) and an overall mental retardation rate of 12.5%; only 4.8% (two patients) required a further pancreatic resection. This compared with a 28% reoperation rate in the other three quarters having less than a 95% pancreatectomy. From this and other studies, a so-called 95% pancreatectomy is generally accepted as the surgical treatment of choice (Cade A et al, 1998; Thomas CG, 1977).

SUMMARY

The case of hyperinsulinaemic hypoglycemia of infancy in NS, 14th days old baby girl, 4200 grams, has been reported. Many factors can cause persistent hyperinsulinaemic hypoglycemia in infancy, and in our case the cause is pancreatic beta cell hyperplasia. Several diagnostic procedure have been done to establish this diagnose. During the treatment we found many problems, especially in management before, during and after operation. The prognosis of the infant with persistent hyperinsulinaemic hypoglycemia

depends on early diagnosis and prompt treatment including closed observation during hospitalization.

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