

Observation of Spontaneous Cerebrospinal Fluid Rhinorrhoea to Body Mass Index: A Preliminary Report

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SUMMARY

The purpose of this retrospective study is to determine whether there is a correlation among overweight, gender and the risk of development of spontaneous cerebrospinal fluid (CSF) rhinorrhoea. The clinical data of eight patients diagnosed with spontaneous cerebrospinal fluid rhinorrhoea who had been treated at our tertiary referral centre between 1998 and 2007 were assessed. Demographically, seven patients were female and one male with ages ranging from 14 to 53 years with a mean age of 43.6 years. This observation revealed that all patients were overweight with a mean body mass index (BMI) of 32.5 kg/m². This study suggests that there is a trend of increasing BMI to the risk of developing a spontaneous CSF rhinorrhoea.

KEY WORDS:

Cerebrospinal Fluid; Rhinorrhoea; BMI

INTRODUCTION

Cerebrospinal fluid (CSF) rhinorrhoea indicates a communication between the nose and the subarachnoid space with breach of bone, dura and arachnoid layers. This causes a potential risk of ascending infection, resulting in meningitis in nine percent to 41 percent of untreated fistulas which mandate surgical repair. The risk increases with the duration of the CSF leak^{1,2}.

CSF rhinorrhoea can be classified as either congenital or acquired (traumatic or spontaneous). Among the traumatic causes, head trauma accounts for 80% of CSF rhinorrhoea and 16% of cases are the result of surgery to the skull base.³ Spontaneous CSF fistulas accounts for 3% to 4% of cases and can be subdivided into primary, where no underlying cause can be found, or secondary to either intra or extracranial pathology. It was first described by Miller² who in 1826 reported a case of a boy who had a progressively enlarging head and recurrent bouts of profuse fluid discharge from the nose. The presence of a fistula was confirmed at necropsy.

Holzmann⁴ and colleagues reported on 17 patient and Schlosser *et al*⁵ on 10 patients with elevated intracranial pressure who presented with primary spontaneous CSF rhinorrhoea. Badia *et al*³ reported on nine cases of primary spontaneous CSF rhinorrhoea. The site of fistulous communication in primary spontaneous CSF rhinorrhoea involves dehiscence in the region of the cribriform plate, sphenoid sinus, fovea ethmoidalis and rarely the frontal sinus. The aim of this study was to identify a correlation between BMI and spontaneous CSF rhinorrhoea.

MATERIALS AND METHODS

The authors retrospectively reviewed the clinical records of eight patients who had spontaneous CSF rhinorrhoea underwent endonasal endoscopic repair of the CSF fistula from October 1988 to April 2007 at the National University Hospital, Kuala Lumpur. Patients' demographic data, weight, height, BMI, the site of the CSF fistula and surgical techniques employed were analysed.

BMI is defined as ratio of weight in kilogram to square of height in metre. According to WHO guidelines, overweight is defined as the body mass index greater than or equal to 25 but less than 30 (≥ 25 but < 30), obese when the body mass index is greater than or equal to 30 but less than 40 (≥ 30 but < 40) and morbidly obese when the BMI greater than or equal to 40 (≥ 40).

RESULTS

Of the eight patients included in the study, seven were females and one a male. The average age was 43.6 years (range 14 to 53 years). They were clinically overweight; their average body mass index was > 32.5 kg/m²; overweight grade 2 (Table I). The average of body mass index of Malaysian population is 23 kg/m².¹⁰ In the eight patients the duration of the CSF rhinorrhoea varied from two months to three years. The presenting complaints were clear watery rhinorrhoea and an associated history of meningitis in two patients (28.6 percent). All patients had evidence of congenital defects in which two cases were associated with encephaloceles and/or meningoencephaloceles. One patient had underlying benign intracranial hypertension with empty sella syndrome.

All patients had high resolution computed tomography (HRCT) which was positive in two cases. One patient had the CT cisternography (CTC) performed which was negative. In the rest of the patients with negative imaging studies, intrathecal sodium fluorescein procedure helped to confirm and identify the site of the CSF leak. The site of fistulous communication was in the sphenoid sinus in three patients (37.5 per cent), in the cribriform plate in four patients (50.0 per cent) and the remaining one in the fovea ethmoidalis (12.5 per cent).

The size of defect ranged from 0.3 to 1.5cm. Free grafts such as abdominal fat were used in the six cases (75.0 per cent) and septal cartilage graft in one case (12.5 per cent) where the defect was in the sphenoid sinus and cribriform plate. A pedicled flap based on the nasal septum was applied to the dehiscence at the anterior skull base.

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Table I: Demographic of patient presenting with primary spontaneous CSF rhinorrhoea

| No | Name | Age | Sex | Race | Height (cm) | Weight (kg) | BMI (kg/m ²) | Procedure |
|----|------|-----|-----|---------|-------------|-------------|--------------------------|---|
| 1 | RD | 14 | F | Kadazan | 152 | 61 | 26.6 | Endoscopic repair (bath plug technique) |
| 2 | DV | 53 | F | Indian | 156 | 65 | 26.7 | Endoscopic repair (bath plug technique) |
| 3 | VD | 37 | F | Indian | 160 | 67 | 26.8 | Endoscopic repair (bath plug technique) |
| 4 | LKE | 44 | M | Chinese | 164 | 74 | 27.5 | Endoscopic repair (onlay septal cartilage graft) |
| 5 | M | 51 | F | Indian | 150 | 68 | 30.2 | Endoscopic repair (bath plug technique) |
| 6 | PD | 35 | F | Indian | 152 | 70 | 30.4 | Endoscopic repair (bath plug technique) |
| 7 | ZA | 39 | F | Malay | 150 | 94 | 41.8 | Endoscopic repair (onlay dural patch, mucoperiosteal septal graft, MT flap) |
| 8 | RA | 38 | F | Malay | 165 | 137 | 50.3 | Endoscopic repair (bath plug technique with free MT graft) |

M = male, F = female, MT = middle turbinate, BMI = body mass index (weight in kg divided by height in m²).

The middle turbinate mucosa was used as a graft in one case (12.5 per cent). Successful repair with primary endonasal endoscopic procedure was observed in seven patients (87.5 per cent). The other one which had underlying benign intracranial hypertension with empty sella syndrome had secondary endonasal endoscopic repair which failed subsequently. The average follow-up period was 31.4 months (range from 16 to 84 months).

DISCUSSION

Sugerman *et al*² in 1995 postulated that central obesity raises intra-abdominal and intrathoracic pressure, consequently increasing the cardiac-filling pressure which in turn impedes the venous return from the brain leading to raised intracranial pressure. Increased intracranial pressure is a significant factor in the production of CSF leak. Dunn *et al*³ in 2005 speculated that the pulsatile variations of CSF pressure on the lamina cribrosa results in subsequent erosion of bone and protrusion of brain and/or meninges forming a meningocele and/or encephalocele. Thus, the pulsatile pressure finally causes rupture of the arachnoid without having the support of underlying bone leading to formation of a fistula. Schlosser *et al*⁶ suggested the possibility that impaired CSF absorption, from whatever cause, leads to an empty sella, pituitary gland compression, and subtle endocrine dysfunction, thereby resulting in obesity. One patient who was obese had underlying benign intracranial hypertension with empty sella syndrome which is usually associated with high pressure leak. Clark *et al*³ in 1994 presented four patients, all females, who were undergoing treatment for benign intracranial hypertension and presented with spontaneous CSF rhinorrhoea. Obese patients are more prone to exaggerated oscillations in intracranial pressure and intracranial hypertension; it therefore follows that obese patients are more at risk of developing a CSF leak. Females are more prone to develop CSF leakage because their bones are thinner⁹. The majority of the spontaneous cases occur in adults in the fourth decade of life, with females outnumbering males (2:1). In this study the author showed that seven patients are female and only one male with spontaneous CSF rhinorrhoea are adult overweight,

presenting an average BMI of 32.5 kg/m². This study also suggested that there is a trend of increasing BMI to possibility of CSF leak. Two of the patients had an associated meningocele and/or encephalocele and the other one patient had underlying benign intracranial hypertension with empty sella syndrome. It is likely that these cases represent a pre-existing defect in the skull base, which was unmasked by raised intracranial pressure accompanying the significant weight gain.

CONCLUSION

This is an observation of overweight patients (BMI greater than 25 kg/m²) presenting with CSF rhinorrhoea. Our study suggests that there is a trend of increasing BMI to the risk of developing a spontaneous CSF rhinorrhoea.

REFERENCES

- Gendeh BS, Mazita A, Selladurai BM, Jegan T, Jeevanan J, Misiran K, *et al*. Endonasal endoscopic repair of anterior skull-base fistulas: the Kuala Lumpur experience. *J Laryngol & Oto* 2005; 119: 866-74.
- Dunn CJ, Alaani A, Johnson AP. Study on spontaneous cerebrospinal fluid rhinorrhoea: its aetiology and management. *J Laryngol & Otol* 2005; 119: 12-15.
- Badia L, Loughran S, Lund V. Primary spontaneous cerebrospinal fluid rhinorrhea and obesity. *Am J Rhinol* 2001; 15(2): 117-9.
- Holzmann D, Wild C. A risk factor for primary spontaneous rhinoliqorrhoea. *Arch Otolaryngol Head Neck Surg* 2003; 129(3): 324-6.
- Schlosser RJ, Wilensky EM, Grady MS, Bolger WE. Elevated intracranial pressures in spontaneous cerebrospinal fluid leaks. *Am J Rhinol* 2003; 17(4): 191-5.
- WHO Expert Committee on Physical status. Physical status: the Use and Interpretation of Anthropometry: report of a WHO expert committee. WHO technical report series 1995; 854: 1-452.
- Mirza S, Thaper A, McClelland L, Jones NS. Sinonasal cerebrospinal fluid leaks: Management of 97 patients over 10 years. *Laryngoscope* 2005; 115(10): 1774-7.
- Lopatin AS, Kapitanov DN, Potapov AA. Endonasal endoscopic repair of spontaneous cerebrospinal fluid leaks. *Arch Otolaryngol Head Neck Surg* 2003; 129(8): 859-63.
- Sugerman HJ, Felton WL, Salvant JB, Sismanis A, Kellum JM. Effects of surgically induced weight loss on idiopathic intracranial hypertension in morbid obesity. *Neurology* 1995; 45(9): 1655-59.
- Lim TO, Zaki M, Fatimah S. Distribution of body weight, height and body mass index in a national sample of Malaysian adults. *Med J Malaysia* 2000; 55: 108-28.