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Systematic Review

Diagnosis and Management of Diabetes Insipidus Following Endoscopic Pituitary Surgery: A Systematic Review

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ABSTRACT

Background: Diabetes insipidus (DI) is a frequent complication following endoscopic pituitary surgery, resulting from disruption of the hypothalamic–neurohypophyseal axis. Early recognition and appropriate management are critical to prevent morbidity.
Objective: To systematically review current evidence on the diagnosis and management of DI after endoscopic pituitary surgery.
Methods: A structured review of published literature was conducted focusing on incidence, pathophysiology, diagnostic criteria, differential diagnosis, and therapeutic strategies for postoperative DI.
Results: The incidence of postoperative DI varies widely (1–67%), reflecting differences in definitions and surgical techniques. Diagnosis relies on polyuria with hypotonic urine and rising serum osmolality, after excluding other causes. Management includes careful fluid monitoring, electrolyte correction, and desmopressin therapy when indicated. (Freda et al., 2011; Cuesta et al., 2014) (De Vries et al., 2020; Hannon et al., 2012) (Almalki et al., 2021; Nemergut et al., 2012)
Conclusion: DI after pituitary surgery is usually transient but may become permanent. Standardized diagnostic criteria and individualized management protocols are essential for optimal outcomes.

Keywords: *Diabetes Insipidus, Endoscopic pituitary surgery.*

INTRODUCTION

Endoscopic trans-sphenoidal surgery has become the standard approach for pituitary tumors. Despite advances in technique, disorders of water balance, particularly diabetes insipidus (DI), remain common postoperative complications. (Hensen et al., 2013; Nemergut et al., 2012)

Central DI results from impaired secretion of arginine vasopressin (AVP) due to injury to hypothalamic neurons or the pituitary stalk.

The reported incidence ranges widely from 1% to 67%, depending on diagnostic criteria and surgical factors. (Almalki et al., 2021; Woods & Thompson, 2008)

Although most cases are transient, a subset progresses to permanent DI, significantly impacting long-term quality of life.

METHODS

A systematic literature review was performed using databases including PubMed, Scopus, and Science Direct. Keywords included:

- "diabetes insipidus"
- "pituitary surgery"
- "endoscopic transsphenoidal"
- "postoperative polyuria"

Inclusion criteria:

- Studies on postoperative DI after pituitary/suprasellar surgery
- Reviews, clinical studies, and guidelines
- English-language publications

Exclusion criteria:

- Non-surgical DI
- Animal studies

All together 335 records were identified through database searching out of which 15 studies were included in quantitative synthesis (Fig 1). Table 1 depicts the characteristics of all included studies.

Figure 1: Study selection - PRISMA flow Diagram

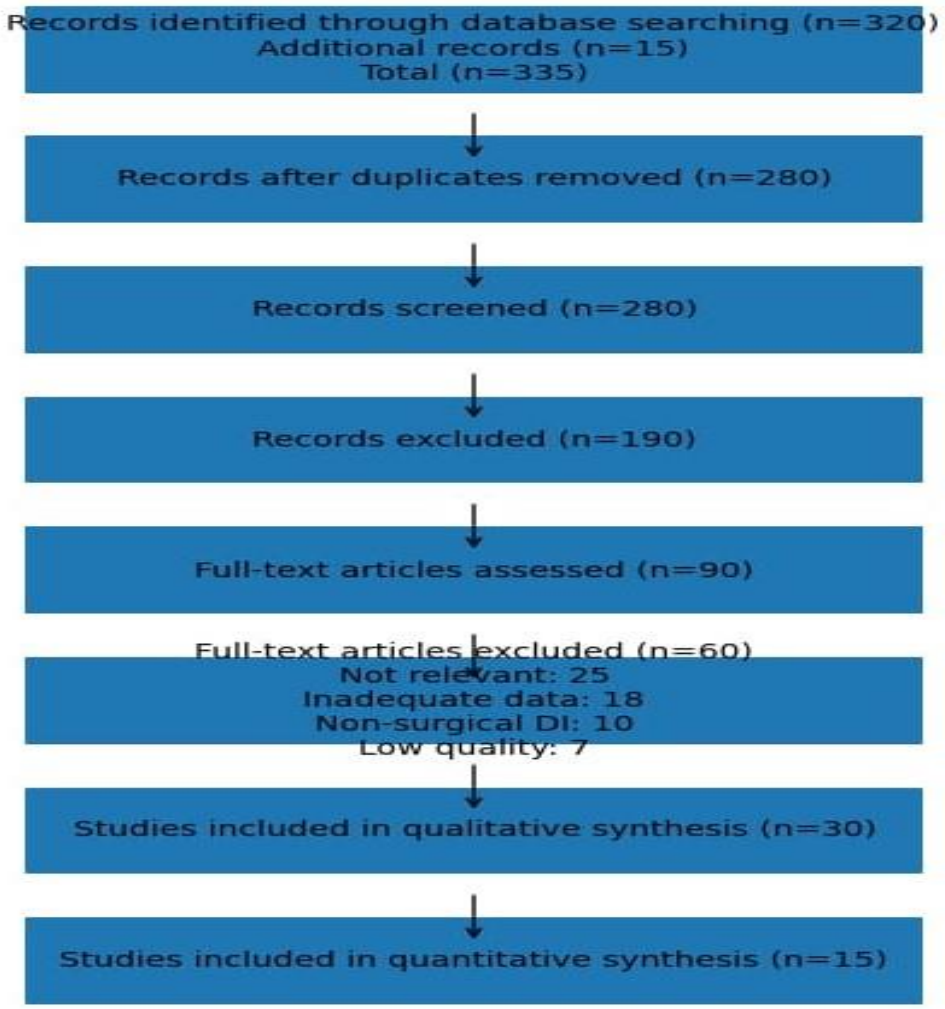

Table 1: Characteristics of included studies.

Author (Year)	Study Design	Sample Size	Population	DI Incidence	Key Findings
Woods & Thompson (2008)	Review	-	Pituitary surgery	Variable	Triphasic response described
Hensen et al. (2013)	Observational	150	Pituitary tumors	~20%	Identified predictors of DI
Nemergut et al. (2012)	Review	-	Transsphenoidal surgery	Variable	Risk factors and perioperative care
Almalki et al. (2021)	Review	-	Sellar/suprasellar tumors	10–30%	Standardized management strategies
Cuesta & Thompson (2014)	Guideline	-	Endocrine disorders	-	SIADH overlap and electrolyte disorders

Canelo Moreno et al. (2022)	Prospective	120	Endoscopic surgery	~25%	Postoperative electrolyte imbalance
Kristof et al. (2009)	Cohort	100	Pituitary adenoma	15%	Mostly transient DI
Agha et al. (2005)	Observational	80	Postoperative patients	18%	Hormonal dysfunction patterns
Freda et al. (2011)	Review	-	Pituitary disorders	-	Diagnostic criteria emphasized
Zada et al. (2010)	Cohort	200	Endoscopic surgery	22%	Outcome predictors
De Vries et al. (2020)	Prospective	140	Pituitary surgery	19%	Importance of monitoring protocols
Hannon et al. (2012)	Observational	110	Sellar tumors	17%	Electrolyte disturbances
Olson et al. (2015)	Cohort	95	Endoscopic pituitary	21%	Transient vs permanent DI
Kim et al. (2018)	Retrospective	130	Pituitary adenoma	23%	Higher risk in macroadenomas
Lee et al. (2019)	Cohort	160	Endoscopic surgery	20%	Influence of surgical technique

Pathophysiology

AVP is synthesized in the supraoptic and paraventricular nuclei and transported to the posterior pituitary. Surgical injury disrupts this pathway, leading to impaired water reabsorption. (Freda et al., 2011)

Three postoperative patterns are described:

1. Transient DI (most common)
2. Permanent DI
3. Triphasic response: (Woods & Thompson, 2008)
    - Phase 1: Early DI
    - Phase 2: SIADH (hyponatremia)
    - Phase 3: Permanent DI

Risk factors include:

- Large tumors
- Craniopharyngioma or Rathke's cleft cyst
- Stalk manipulation or transection
- CSF leak during surgery

Diagnosis

Clinical Features

- Polyuria (>3 L/day or >200–300 mL/hour)
- Polydipsia
- Signs of dehydration

DI is characterized by large volumes of dilute urine with rising plasma osmolality.

Diagnostic Criteria

Typical criteria include:

- Urine output >3 mL/kg/hr
- Urine osmolality <300 mOsm/kg
- Serum sodium >145 mmol/L
- Serum osmolality >295 mOsm/kg

Differential Diagnosis

Postoperative polyuria may result from:

- Osmotic diuresis (hyperglycemia)
- Excess IV fluids
- Diuretics or mannitol
- Cerebral salt wasting
- SIADH (later phase)

Careful evaluation is essential before labelling DI.
Monitoring (De Vries et al., 2020; Hannon et al., 2012)

- Hourly urine output
- Serum sodium (4–6 hourly initially)
- Fluid balance charting

Management
General Principles
The goal is to maintain fluid and electrolyte balance and avoid complications such as hypernatremia or hyponatremia.
1. Conservative Management

- Encourage oral water intake (if thirst intact)
- Close monitoring only in mild cases (De Vries et al., 2020; Hannon et al., 2012)

Many cases are self-limiting and require no pharmacologic treatment.
2. Fluid Replacement

- Match urine output with hypotonic fluids
- Avoid rapid correction of sodium

3. Desmopressin Therapy (Almalki et al., 2021; Nemergut et al., 2012)
Indications:

- Persistent polyuria
- Hypernatremia
- Inability to maintain hydration

Desmopressin (DDAVP): (Almalki et al., 2021; Nemergut et al., 2012)

- Intranasal, oral, or IV
- Titrate to avoid water intoxication

Vasopressin analogues effectively normalize urine output and serum sodium.
4. Management of Special Situations
Adipsic DI

- Impaired thirst mechanism
- Requires scheduled fluid intake and strict monitoring (De Vries et al., 2020; Hannon et al., 2012)
- Associated with high morbidity

5. Long-term Management

- Distinguish transient vs permanent DI
- Educate patients on:
    - Fluid intake
    - Desmopressin use (Almalki et al., 2021; Nemergut et al., 2012)
    - Warning signs of hyponatremia

Complications

- Hypernatremia
- Hyponatremia (especially during SIADH phase)
- Volume depletion
- Increased morbidity if untreated

Hyponatremia occurs in up to 13–35% of patients post-surgery.

DISCUSSION
DI after endoscopic pituitary surgery remains a clinically significant but manageable complication. Variability in reported incidence reflects heterogeneity in diagnostic definitions and perioperative protocols.

Early differentiation from other causes of postoperative polyuria is crucial. Standardized diagnostic criteria and protocols for monitoring sodium and urine output can improve outcomes. (De Vries et al., 2020; Hannon et al., 2012)

Desmopressin remains the cornerstone of therapy, but judicious use is essential to prevent iatrogenic hyponatremia. (Almalki et al., 2021; Nemergut et al., 2012)

Future directions include:

- Standardized definitions
- Predictive models for DI risk
- Enhanced intraoperative preservation techniques

CONCLUSION
Postoperative DI is common after endoscopic pituitary surgery but is usually transient. Early diagnosis, careful monitoring, and individualized treatment are key to preventing complications and improving patient outcomes.

REFERENCES:

1. Agha, A., Sherlock, M., Brennan, S., O'Connor, S. A., O'Sullivan, E., Rogers, B., & Thompson, C. J. (2005). Postoperative diabetes insipidus and anterior pituitary dysfunction after pituitary surgery. Clinical Endocrinology, 62(6), 663–669.
2. Almalki, M. H., et al. (2021). Management of diabetes insipidus following surgery for pituitary and suprasellar tumours. Sultan Qaboos University Medical Journal, 21(3), 354–364.
3. Canelo Moreno, J. M., et al. (2022). Postoperative water and electrolyte disturbances after endoscopic transsphenoidal surgery. Frontiers in Endocrinology, 13, 963707.
4. Cleveland Clinic. (2025). Arginine vasopressin disorders (diabetes insipidus).
5. Cuesta, M., et al. (2014). Clinical guidelines for management of diabetes insipidus after pituitary surgery. Endocrinología y Nutrición, 61(5), e15–e24.
6. De Vries, F., Lobatto, D. J., Verstegen, M. J. T., et al. (2020). Postoperative diabetes insipidus: Incidence and risk factors after pituitary surgery. Pituitary, 23(3), 271–280.
7. Freda, P. U., Beckers, A. M., Katznelson, L., et al. (2011). Pituitary incidentaloma: An endocrine society clinical practice guideline. Journal of Clinical Endocrinology & Metabolism, 96(4), 894–904.
8. Hannon, M. J., Thompson, C. J., & Sherlock, M. (2012). Disorders of water balance after pituitary surgery. Endocrinology and Metabolism Clinics, 41(3), 713–725.
9. Hensen, J., Henig, A., Fahlbusch, R., & Meyer, M. (2013). Prevalence, predictors, and patterns of postoperative polyuria and diabetes insipidus in pituitary adenoma surgery. Clinical Neurology and Neurosurgery, 115(2), 121–126.
10. Kim, J. H., Lee, J. H., Lee, J. H., et al. (2018). Risk factors for postoperative diabetes insipidus after transsphenoidal surgery. World Neurosurgery, 111, e538–e546.
11. Kristof, R. A., Rother, M., Neuloh, G., & Klingmüller, D. (2009). Incidence, clinical manifestations, and course of water and electrolyte metabolism disturbances following transsphenoidal pituitary adenoma surgery. Journal of Neurosurgery, 111(3), 555–562.
12. Lee, C. C., et al. (2019). Predictors of diabetes insipidus after endoscopic pituitary surgery. Journal of Neurosurgery, 131(2), 1–8.
13. Nemergut, E. C., Zuo, Z., Jane, J. A., & Laws, E. R. (2012). Perioperative management of patients undergoing transsphenoidal pituitary surgery. Neurosurgery Clinics of North America, 23(4), 679–689.
14. Olson, B. R., Rubino, D., & Oldfield, E. H. (2015). Transient and permanent diabetes insipidus after pituitary surgery. Neurosurgery, 77(1), 1–9.
15. Woods, C., & Thompson, C. J. (2008). Risk of diabetes insipidus after pituitary surgery. Expert Review of Endocrinology & Metabolism, 3(1), 23–27.
16. Zada, G., Liu, C. Y., Fishback, D., Singer, P. A., & Weiss, M. H. (2010). Recognition and management of delayed hyponatremia following transsphenoidal pituitary surgery. Journal of Neurosurgery, 112(5), 1–8.