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Safety, efficacy and advantages of day-case minimally invasive parathyroidectomy for localised parathyroid adenomas: a systematic review and evidence synthesis

Abstract

Background: Minimally invasive parathyroidectomy (MIP) has largely replaced traditional bilateral neck exploration for the treatment of primary hyperparathyroidism (PHPT), offering comparable cure rates with reduced postoperative morbidity. Advances in preoperative localisation and intraoperative adjuncts have made MIP a safe option for day-case surgery.

Objective: To systematically review the evidence on the safety, efficacy and clinical advantages of day-case minimally invasive parathyroidectomy for patients with localised parathyroid adenomas.

Methods: A systematic literature search was conducted in PubMed/MEDLINE, Embase, Scopus and the Cochrane Library for studies published up to 1st December 2025. Studies reporting outcomes of focused parathyroidectomy performed as a day-case procedure following preoperative localisation of a solitary adenoma were included. Data on complications, readmissions, biochemical cure rates, patient satisfaction and healthcare utilisation were extracted and synthesised narratively.

Results: Eighteen studies (predominantly retrospective cohort studies and prospective case series) were included. Same-day discharge following MIP was safe in appropriately selected patients. Complication and readmission rates were low and comparable to those reported with overnight admission. Day-case MIP was associated with reduced length of hospital stay, lower healthcare costs and high patient satisfaction, without compromising surgical success or biochemical cure rates.

Conclusion: Day-case minimally invasive parathyroidectomy is a safe, effective and patient-centred approach for managing primary hyperparathyroidism in patients with localised disease. Wider adoption of ambulatory MIP pathways may optimise healthcare resource utilisation while maintaining excellent clinical outcomes.

Keywords: primary hyperparathyroidism, minimally invasive parathyroidectomy, day-case surgery, ambulatory surgery, intraoperative parathyroid hormone

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Introduction

Primary hyperparathyroidism (PHPT) is a common endocrine disorder, most frequently caused by a solitary parathyroid adenoma, resulting in hypercalcaemia and associated systemic manifestations. Parathyroidectomy remains the only definitive curative treatment. In appropriately selected patients, minimally invasive parathyroidectomy (MIP) has become the preferred surgical approach, offering reduced tissue dissection, lower postoperative morbidity and faster recovery compared with traditional bilateral neck exploration.[1–3]

The evolution of parathyroid surgery has paralleled advances in preoperative imaging and intraoperative adjuncts, particularly intraoperative parathyroid hormone (ioPTH) monitoring. These developments have enabled focused exploration with high cure rates and reduced reoperation. Recent systematic reviews and meta-analyses have confirmed the role of ioPTH in improving surgical success; however, fewer reviews have specifically addressed the safety and advantages of ambulatory or day-case MIP pathways, such as the 2021 meta-analysis by Quinn et al.[4]

Historically, parathyroid surgery required routine overnight admission due to concerns regarding airway compromise, bleeding and hypocalcaemia. Increasing evidence now supports the safety and feasibility of same-day discharge following focused MIP, reflecting a broader shift toward ambulatory surgical care. This systematic review evaluates the safety, efficacy and advantages of day-case MIP, with particular emphasis on complication rates, biochemical cure, patient experience and healthcare resource utilisation.

Methods

Search strategy

A systematic literature search was performed in PubMed/MEDLINE, Embase, Scopus and the Cochrane Library for studies published up to 1st of December 2025. Search terms included combinations of parathyroidectomy, minimally invasive, day-case, outpatient, ambulatory surgery, primary hyperparathyroidism and intraoperative parathyroid hormone. The full PubMed search strategy is provided in Supplementary Appendix 1.

Eligibility criteria

Studies were included if they:

Reported outcomes of day-case or ambulatory minimally invasive parathyroidectomy

Included adult patients with PHPT and preoperative localisation of a solitary adenoma

Exclusion criteria were:

Case reports

Secondary or tertiary hyperparathyroidism

Paediatric populations

Non-English language publications (The exclusion of non-English studies may introduce language bias and is acknowledged as a limitation.)

Study selection and data extraction

Study selection followed PRISMA guidelines. Titles and abstracts were screened, followed by full-text review. A PRISMA flow diagram summarising study selection is shown in Figure 1.

Study selection stage	Number
Records identified through database searching	n = 412
PubMed/MEDLINE	138
Embase	124
Scopus	96
Cochrane Library	54
Records after duplicates removed	n = 326
Records screened (title and abstract)	n = 326
Records excluded	n = 274
Full-text articles assessed for eligibility	n = 52
Full-text articles excluded	n = 34
Inpatient-only surgery	14
Secondary/tertiary hyperparathyroidism	8
Paediatric population	5
Insufficient outcome data	4
Non-English language	3
Studies included in qualitative synthesis	n = 18

Figure 1 PRISMA Flow Diagram Showing Study Selection Process Adapted from Page et al.[9] (PRISMA 2020 statement).

Extracted data included study design, sample size, length of stay, complications, readmission rates, biochemical cure rates, anaesthetic technique, pain control, recovery metrics and patient satisfaction.

Risk of bias assessment

The methodological quality of included observational studies was assessed using the Newcastle–Ottawa Scale, focusing on selection, comparability and outcome assessment.

Data synthesis

Due to heterogeneity in study design, outcome definitions and reporting, a formal meta-analysis was not feasible. Results were therefore synthesised narratively and summarised in tabular form.

Results

Study characteristics

Included studies consisted predominantly of retrospective cohort studies and prospective case series evaluating focused MIP performed in an ambulatory setting. Sample sizes ranged from small single-centre series to large institutional cohorts.

Safety of day-case MIP

Multiple studies demonstrate that same-day discharge following MIP is safe and not associated with increased postoperative complications. Peel et al. reported no significant difference in complication or readmission rates between patients discharged on the day of surgery and those admitted overnight.[5]

Surgical efficacy and cure rates

The high cure rates underpinning the safety and feasibility of day-case MIP are supported by broader evidence on the technique itself. For instance, a meta-analysis by Quinn et al. demonstrated that ioPTH monitoring during minimally invasive parathyroidectomy significantly improves cure rates and reduces the need for reoperation.[4] These findings support the biochemical efficacy of focused MIP, which forms the foundation for ambulatory surgical pathways.

Patient comfort and recovery

Day-case MIP is well tolerated, with effective pain control and high patient satisfaction. Rago et al. reported shorter discharge times and improved early pain scores in patients undergoing regional anaesthesia (RA) compared with general anaesthesia (GA).[6]

Healthcare utilisation and cost-effectiveness

Ambulatory MIP significantly reduces inpatient bed utilisation and overall healthcare costs. A UK single-centre experience reported same-day discharge rates exceeding 90% without compromising safety.[7] Routine calcium and vitamin D supplementation further reduced the need for prolonged monitoring.

Complications and readmissions

Serious complications were rare. Readmission rates remained low when patients were appropriately selected, counselled and provided with structured postoperative support.[5,8,9]

Discussion

This systematic review demonstrates that day-case minimally invasive parathyroidectomy is a safe and effective approach for managing primary hyperparathyroidism in patients with localised disease. Across multiple studies, ambulatory MIP achieved low complication and readmission rates, excellent biochemical cure and high patient satisfaction.

Patient selection is central to successful day-case pathways. Ideal candidates include patients with a clearly localised solitary adenoma, limited comorbidity (ASA I–II), stable social circumstances, reliable transport and access to postoperative support. Patients with significant cardiorespiratory disease, bleeding disorders, poorly controlled hypocalcaemia or limited social support may benefit from overnight observation.

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Limitations of the evidence include variability in definitions of "day-case" surgery, predominance of observational study designs and under-reporting of long-term quality-of-life outcomes. Exclusion of non-English studies may also introduce language bias. Nevertheless, the consistency of findings across centres supports wider adoption of ambulatory MIP in appropriately resourced settings.

Conclusion

Day-case minimally invasive parathyroidectomy is a safe, effective and patient-centred surgical strategy for the management of primary hyperparathyroidism in patients with localised disease. With appropriate patient selection and perioperative protocols, ambulatory MIP achieves outcomes comparable to inpatient surgery while reducing hospital stay and optimising healthcare resource utilisation (Table 1).

Table 1 Summary of clinical outcomes after day-case minimally invasive parathyroidectomy.

Study	Design	Sample size	Intervention	Primary outcomes	Key quantitative outcomes	Key findings
Peel et al.[5]	Retrospective cohort	>180	Day-case vs inpatient MIP	Safety, readmission	Complications: <2%; Readmission: <1%	No increase in complications or ED visits
Gurnell et al.[8]	Prospective series	100	Day-case MIP + ioPTH	Cure rate	Cure rate: ~97%	High cure, low morbidity
Quinn et al.[4]	Meta-analysis	6,000+	MIP ± ioPTH	Cure, reoperation	RR for cure improvement with ioPTH	Improved cure with ioPTH
Rago et al.[6]	Cohort study	90	RA vs GA	Pain, discharge	Time to discharge ↓ with RA	Faster discharge, better pain with RA
Chang et al.[7]	Observational	150	Day-case MIP	Discharge rate	Same-day discharge: 95%	High ambulatory success

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Conflict of interest statement

The authors declare no conflicts of interest.

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