

A Nomogram for Relapse/Death and Contemplating Adjuvant Therapy for Parathyroid Carcinoma



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KEYWORDS

- Parathyroid carcinoma • Parathyroid cancer • Parathyroid neoplasms • Prognosis
- Nomograms • Molecular targeted therapy • Next-generation sequencing
- Immunotherapy

INTRODUCTION

Parathyroid carcinoma (PC) is a rare endocrine disease. Until 2001, the annual incidence was 1 to 3 people per 10 million; in the last decade, however, its annual incidence in the United States and Asia has increased to approximately 10 people per 10 million.^{1–4} Lee and colleagues suggest that this increased incidence is the result of 2002 National Institutes of Health guidelines on parathyroidectomy in asymptomatic patients with hyperparathyroidism identified by screening for hypercalcemia.^{1,5–7}

Various clinical and biochemical findings can raise suspicion of the presence of a PC. These include palpable cervical mass, parathyroid gland >30 mm, moderate-to-severe hypercalcemia, significantly elevated parathyroid hormone (PTH) levels (three to five times the limit of normal), and intraoperative observation of adhesions to surrounding tissues (thyroid, muscle, esophagus, and laryngeal nerve).^{7–10} However, PC can be difficult to distinguish from other etiologic causes of hyperparathyroidism during preoperative and intraoperative diagnosis because the previously mentioned parameters are not categorically present. Thus, the unequivocal histopathological presentation is required to confirm the PC diagnosis.

Currently, the histologic diagnosis of PC is restricted to those parathyroid tumors that show one of the following: angioinvasion, lymphatic invasion, perineural or intraneural invasion, local malignant invasion into other anatomic structures, or histologically/cytologically documented metastatic disease.¹¹ In 2022, the World Health Organization (WHO) applied histopathological criteria and defined the roles of ancillary techniques for the diagnosis of PC. Biomarkers in the new WHO classification for the differential diagnosis of PC included are; APC, RB, E-cadherin, p27, Bcl-2a, mdm-2,

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