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Clinical Outcomes and Imaging in Basosquamous Carcinoma Compared with Basal and Squamous Cell Carcinomas: A Systematic Review

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ABSTRACT

Background: Basosquamous carcinoma (BSC) is a rare keratinocyte carcinoma with histological features overlapping with those of basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). It behaves aggressively, showing higher recurrence and metastatic risks, and remains difficult to diagnose and treat.

Objective: This review compared the outcomes and imaging features of BSC with those of BCC and SCC, while identifying prognostic factors and management approaches.

Methods: A systematic review under the PRISMA 2020 guidelines included studies (2010–2025) on histologically confirmed BSC, BCC, or SCC reporting outcomes or imaging findings.

Results: BSC showed recurrence rates of 4.5–14% and metastasis rates of 3–5.6%, exceeding BCC but generally lower than those of SCC. Prognostic factors included incomplete excision, perineural invasion, deep infiltration, and ear involvement. Dermoscopy and confocal microscopy revealed hybrid BCC/SCC features, while molecular studies supported BSC as a distinct entity. Wide excision and Mohs surgery were effective, and incomplete excision increased the risk of recurrence.

Conclusion: BSC is an aggressive carcinoma that lies between BCC and SCC in terms of behavior. Effective care requires margin-controlled excision, long-term surveillance, and the integration of imaging with molecular insights to aid diagnosis and guide future therapies.

Keywords: *Basosquamous carcinoma; basal cell carcinoma; squamous cell carcinoma; dermoscopy; recurrence; Mohs micrographic surgery*

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1. INTRODUCTION

Non-melanoma skin cancers (NMSCs) are the most common malignancies globally, with basal cell carcinoma (BCC) and cutaneous squamous cell carcinoma (SCC) being the most prevalent. In the spectrum, basosquamous carcinoma (BSC) is found in an unusual and problematic location. First described more than a century ago, BSC has been the subject of debate for many years regarding its classification as either a variant of BCC with squamous differentiation, a collision tumor, or an independent entity with a unique biological behaviour. Advances in dermatopathology, dermoscopy, and molecular

diagnostics have resulted in the recognition of BSC as a distinct type of keratinocyte carcinoma with histological and clinical features that overlap with both BCC and SCC[1,2]. BSC requires special care in clinical treatment because it is more serious than conventional BCC, displaying higher recurrence and metastatic potential [3,4].

BSC is a minor subset of keratinocyte carcinomas, accounting for less than 2% to 4% of massive series, although its morbidity is disproportionately higher than its incidence [4,5]. Epidemiological studies support a predilection for the elderly (often the 7th or 8th decade of life) with only a slight male predominance [3,6]. Anatomically, BSC has an impressive distribution in sun-exposed areas, mostly the head and neck, with the nose and periorbital areas being the most common sites of involvement [4,5]. These trends are shared risk factors with other keratinocyte carcinomas, including chronic ultraviolet radiation exposure, cumulative photodamage, and immunosenescence. Comparative studies have shown that although the demographic and environmental profiles of BSC patients are similar to those of BCC and SCC patients, their outcomes are distinctly less favourable.

BSC is characterized by areas of basaloid cells with peripheral palisading and mucinous stroma, which are characteristic of BCC, along with foci of squamous differentiation, keratinization, or intercellular bridges, which are characteristic of SCC. The World Health Organisation's 2018 classification formally declared BSC to be a new entity, which highlights both the hybrid morphology and the capability to be aggressive [7]. Recently, the WHO revised the "Blue Books," and it is now widely accepted as a prime component within the spectrum of keratinocyte carcinomas, with dual differentiation as a diagnostic criterion [8]. Immunohistochemistry can be performed to support the diagnosis in suspicious cases. For instance, BCC markers such as Ber-EP4 and Bcl-2 are expressed along with SCC-associated markers such as EMA or CEA, which causes confusion in their differentiation and strengthens the role of BSC as an intermediary[9]. The identification of these overlapping profiles is critical for preventing misclassification and ensuring correct treatment planning.

Dermoscopy is critical for the early diagnosis of BSC, especially in the process of differentiating it from the more common BCC and SCC. Multiple studies have described a characteristic dermoscopic pattern in BSC, such as arborizing or branching vessels, blue-gray globules, and ulceration features typically found in BCC, keratin masses, white opaque areas, and surface scales typically found in SCC [10,11]. These overlapping patterns were also confirmed by Sgouros et al. It was shown that the combination of at least one BCC feature and one SCC feature is a great predictor of BSC [6]. These papers highlight how dermoscopy can be used to increase clinical suspicion and in biopsy decisions.

Reflectance confocal microscopy (RCM) has also been shown to be encouraging in the development of noninvasive BSC diagnosis. RCM allows real-time imaging at the cellular level that identifies architectural disarray and atypia in relation to the histological features of hybrid tumours [12,13,14]. In combination with dermoscopy, RCM improves diagnostic accuracy and interobserver reproducibility especially when dealing with a challenging diagnostic lesion [12]. These improvements in multimodal imaging are in line with general trends in dermatologic oncology to noninvasive diagnosis that reduce unnecessary excisions and improve triage of high-risk patients.

Molecular biology of BSC has not been fully characterised yet, BCC and SCC studies have been important in illuminating contexts. BSC is also often associated with the signature of BCC, the alterations in the pathway of Hedgehog signalling [15]. In parallel, molecular studies suggest that additional mutations that have consequences on keratinocyte differentiation and tumour invasiveness may underlie the intermediate aggressiveness of BSC. With a knowledge of these pathways, not only the accuracy of the diagnosis is increased, but also a specific treatment in cases of refractory/advanced cases is possible. The heterogeneity of the molecules justifies the fact that BSC is a biologically distinct carcinoma and not an effortless fusion of BCC and SC.

BSCs have consistently worse outcomes than BCC and are more similar to SCC. Recurrence rates are 4-14% and metastasis has been reported in 3-5.6% of patients, depending on the size of the cohort and length of follow-up [3,4,6]. Predictors of poor prognosis include incomplete excision, perineural invasion, deep tissue infiltration and localization to anatomically complex sites such as the ear [5,6]]. These features support the classification of BSC as a high-risk carcinoma that requires keen management. Indeed, a number of series report that the risk of recurrence is significantly higher when excision margins are narrow, emphasising the importance of adequate initial surgery [3,4].

Comparisons with SCC outcomes show that although BSC may not metastasize as often as SCC, its risk is far greater than conventional BCC, and thus cannot be managed conservatively as an indolent lesion. This intermediate profile justifies its inclusion in high-risk pathways, even though it is rare.

The major guidelines from NCCN and European consortia mainly focus on BCC and SCC, their risk-adapted frameworks offer a valuable window through which to manage BSC. The NCCN Guidelines for Patients are focused on surgical excision with margin control as well as risk stratification and long-term surveillance for high-risk keratinocyte carcinomas [16]. Similarly, the European consensus-based guidelines emphasise interdisciplinary collaboration, the evaluation of margins, and individualised treatment strategies for BCC [17] and invasive SCC [18]. While BSC is not covered in a separate section, clinical experience and retrospective data suggest that these principles can be directly extrapolated. Importantly, the WHO classification acknowledges that BSC is a distinct carcinoma and this reinforces the need for

clinicians to adopt a more aggressive management strategy than they might for typical BCC [7,19].

The wider context of the epidemiology of skin cancer also supports this approach. Stratigos et al. note that invasive SCC already represents significant morbidity and mortality in NMSC, and if hybrid phenotypes such as BSC are taken into consideration, the clinical burden may be underestimated [18]. Additional studies of BCC variants show site-specific variation in aggressiveness, again highlighting that histopathologic nuance corresponds to divergent outcomes [20]. It's important to recognize these patterns for evidence-based decision-making.

Despite emerging consensus, uncertainties remain about the origin of BSC, the best treatment protocols, and long-term prognosis. Some authors still believe that BSC represents metatypical BCC with squamous differentiation and not a completely distinct entity [1]. Others highlight the fact that the lack of specific guideline recommendations means that management decisions are heavily dependent on the individual clinician's judgement [2]. Some of these controversies may be resolved by future improvements in imaging, molecular profiling and targeted therapy. Importantly, the combination of dermoscopy, RCM, and immunohistochemistry provides a multipronged diagnostic pathway that is becoming more accessible to clinicians in both academic and community settings [10-12]. Moreover, the appreciation of dual differentiation in recent WHO updates is part of a general paradigm shift towards increased precision in the classification of hybrid and borderline tumours [8].

The purpose of this systematic review was threefold. First, to synthesize comparative data on clinical outcomes of BSC in comparison to BCC and SCC, focusing on recurrence, metastasis and survival. Second, to consolidate dermoscopic and imaging descriptors that distinguish BSC from BCC and SCC at the point of care. Third, to combine histopathological and guideline-based frameworks to make practical recommendations for management and follow-up of this rare but clinically important carcinoma.

2. METHODOLOGY

2.1 Protocol and Reporting Standards

To achieve rigour, transparency and reproducibility, this systematic review was reported and designed in line with the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines.

2.2 Eligibility Criteria

The inclusion criteria were studies that dealt with patients with basosquamous carcinoma (BSC), BCC, or SCC, which were confirmed histologically. The eligible studies included clinical outcomes and/or radiographic appearances of BSC, BCC, and/or SCC. The clinical outcomes taken into consideration were recurrence, metastasis, disease-free survival, overall survival and response to treatment. Imaging results were dermoscopic features, histopathological correlates and radiological findings using modalities such as CT, MRI and PET/CT. Included designs were randomised controlled trials, cohort studies, case-control studies, cross-sectional studies and case series involving more than 10 patients. Only peer-reviewed, full-text articles published in English between January 2010 and March 2025 were considered. The exclusion criteria were as follows: case reports with fewer than ten patients, reviews, editorials, conference abstracts without sufficient data, non-peer-reviewed literature, non-human studies, and publications that did not address either clinical or imaging outcomes.

2.3 Information Sources and Search Strategy

A systematic literature search was directed on PubMed/MEDLINE, Web of Science, Scopus, ScienceDirect, and SpringerLink. To ensure inclusiveness, the reference lists of eligible studies and relevant reviews were manually screened. The search strategy combined Medical Subject Headings (MeSH) and free-text keywords, including “basosquamous carcinoma,” “basal cell carcinoma,” “squamous cell carcinoma,” “clinical outcomes,” “recurrence,” “metastasis,” “survival,” “dermoscopy,” “histopathology,” and “radiology.” The search was restricted to studies published between January 2010 and March 2025.

2.4 Study Selection

All retrieved citations were imported into reference management software, and duplicates were eliminated. A total of 1,320 records were identified, of which 1,000 were obtained from databases and 320 from manual reference checks. After 70 duplicates were removed, 1,250 unique records were screened at the title and abstract levels. During this stage, 1,025 studies were excluded as irrelevant to the research topic. The remaining 225 articles underwent full-text review, resulting in the exclusion of 210 articles for reasons including non-relevant topic (n = 50), wrong population (n = 40), non-comparative focus (n = 30), non-peer-reviewed source (n = 20), insufficient clinical or imaging data (n = 20), language restrictions (n = 25), and duplicate or overlapping data (n = 25). Ultimately, 15 studies fulfilled all eligibility criteria and were included in the qualitative and quantitative synthesis. The PRISMA flow diagram provides a summary of the research

selection procedure (Figure 1).

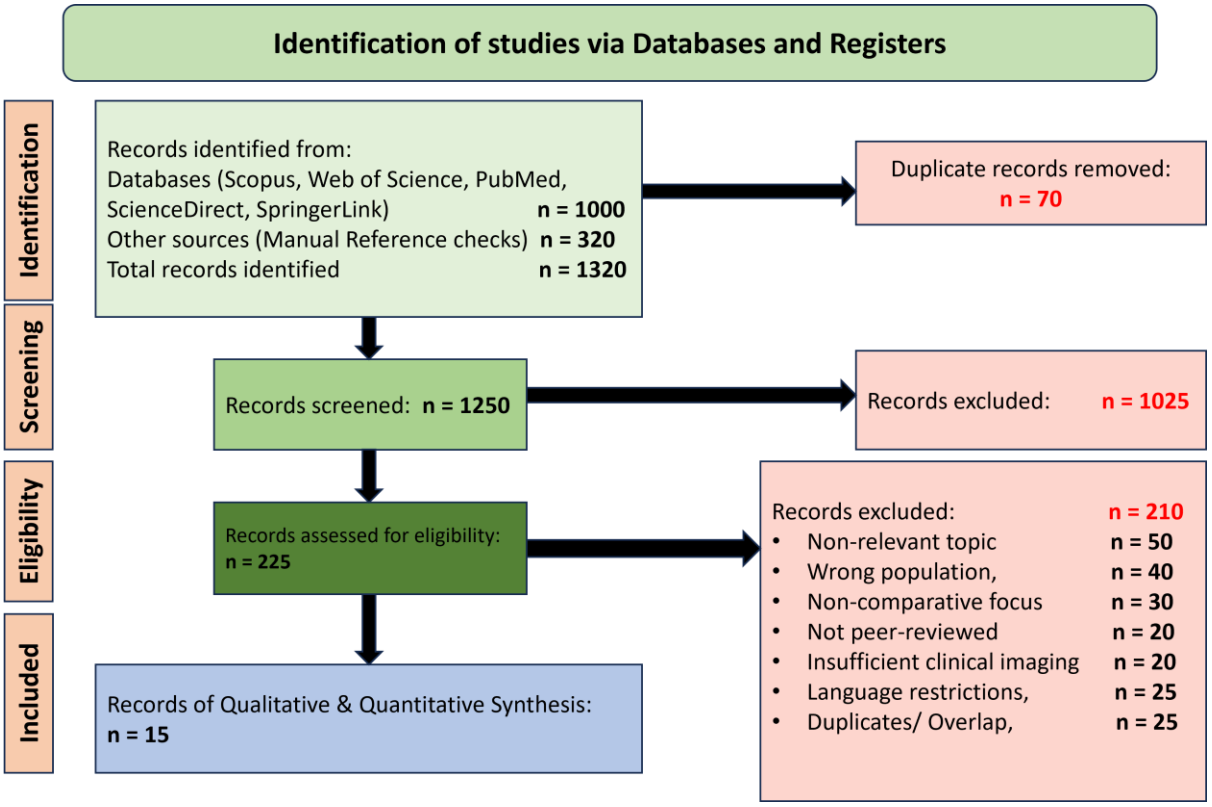


Figure 1: PRISMA flow diagram of study selection

2.5 Data Extraction

To guarantee accuracy and consistency, data extraction was done using a consistent template. Important factors were patient demographics, tumor characteristics, clinical outcomes, imaging results, and research characteristics ("author, year of publication, country, and design"). Extracted information was carefully cross-checked against source material to minimize errors and maintain reliability.

2.6 Data Synthesis

Findings were synthesized narratively to summarize clinical and imaging outcomes. Where sufficient homogeneity was observed, meta-analysis was conducted using Review Manager (RevMan). Pooled effect sizes were expressed as odds ratios or hazard ratios with corresponding 95% confidence intervals. Statistical heterogeneity was quantified using the I^2 statistic, with values greater than 50 percent indicating substantial heterogeneity. Subgroup analyses were performed to explore differences across imaging modalities and clinical outcome measures.

3. RESULTS

3.1 Study Characteristics

The included studies consisted of retrospective cohorts, case series, dermoscopy/imaging investigations, and narrative reviews with original data. Sample sizes ranged from 15 to 181 BSC patients. Head and neck, particularly the nose, cheek, and ear, were the most common tumor sites. Several studies provided direct comparisons with BCC and SCC, while others described clinical, histopathological, or dermoscopic features in detail. Table 1 presents a thorough summary of every study.

Table 1: Summary of Included Studies on BSC Compared with SCC and SCC. (2010–2025)

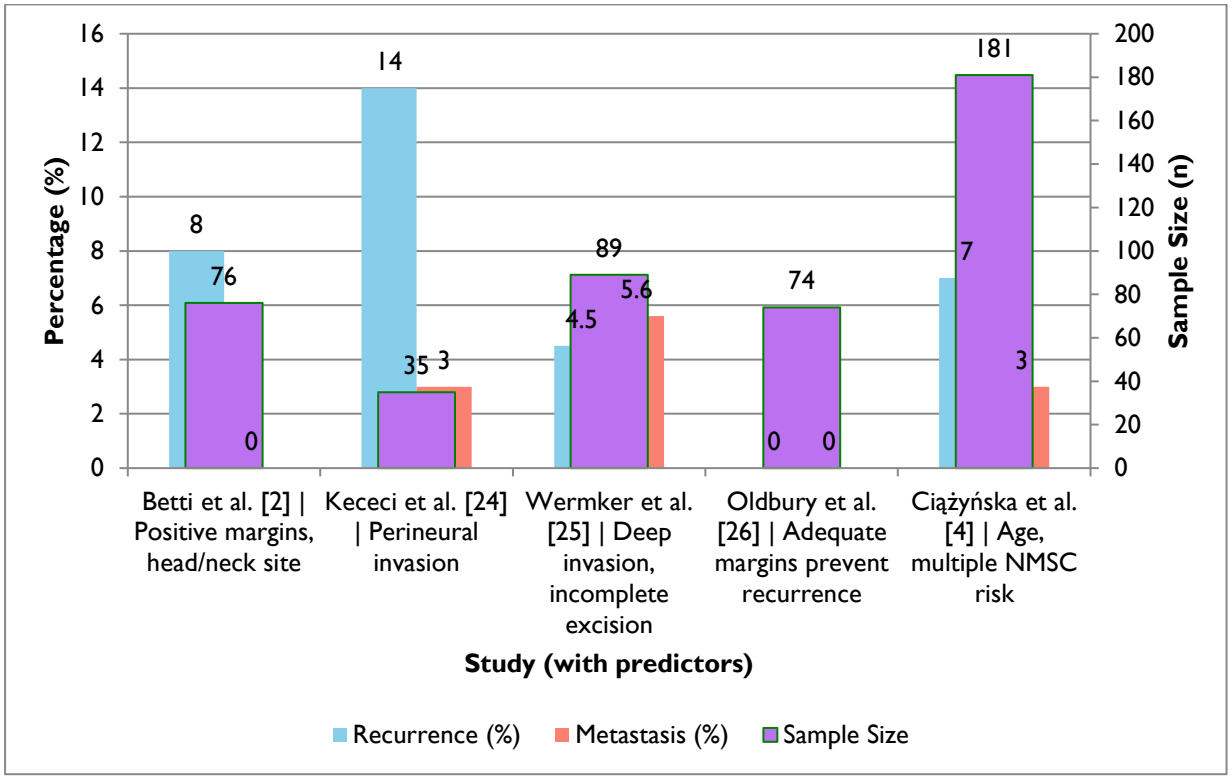
Study.	Study Design / Setting	Sample & Population	Clinical Outcomes	Imaging / Pathology Findings	Main Conclusion
Somoano et al.[21]	Surgical techniques study	Mixed NMSC cohort (includes BSC)	Focus on reconstructive outcomes, not recurrence	Flap techniques for facial tumors	Demonstrates reconstructive strategies but limited BSC-specific outcome data.
Betti et al. [3]	Retrospective comparative study	76 BSC vs 3643 BCC vs 305 SCC	Higher incomplete excision vs BCC; recurrence closer to SCC	Aggressive growth, head/neck location common	BSC behaves more aggressively than non-aggressive BCC.
Giacomel et al. [10]	Dermoscopy study	22 BSC lesions	Not reported	Unfocused arborizing vessels, blue-gray blotches, keratin masses, ulceration	A combination of BCC + SCC dermoscopic features is diagnostic clue.
Allen et al. [22]	Retrospective cohort, Mohs surgery	28 BSC, 72 metatypical BCC	Local recurrence rare post-Mohs; no metastases	Histology confirmed mixed basal/squamous patterns	Mohs is effective; recurrence risk lower than conventional excision.
Baker et al.[23]	Educational cadaveric biopsy project	Training model, not clinical	Not applicable	Pathological specimens used for teaching	Methodological/educational; included as background but not outcome data.
Kececi et al. [24]	Retrospective case series	35 BSC	Local recurrence 14%, metastasis 3%	Aggressive histopathology with perineural invasion in some	Confirms BSC's more aggressive potential than BCC.
Wermker et al. [25]	Retrospective, head/neck tumors	89 BSC	Local relapse 4.5%, nodal metastasis 5.6%	Muscle/vessel invasion significant prognostic factors	Prognosis worse with deep invasion; clinical course resembles SCC.
Akay et al. [11]	Case series, dermoscopy	15 BSC cases	Not reported (imaging focus)	Branched/serpentine vessels, keratin masses, ulceration, white opaque areas	BSC shows combined BCC and SCC dermoscopic features; dermoscopy aids suspicion.
Tan et al. (2017) [1]	Narrative review	Literature synthesis	Summarizes recurrence 12–51%; metastatic risk higher than BCC	Imaging/dermoscopy overlaps described	BSC is controversial but clinically aggressive; future studies needed.
Oldbury et al. [26]	Single-center retrospective	74 BSC	No recurrences/metastases with adequate excision	Histology confirmed mixed features	Adequate margins → excellent prognosis; protocol proposed.
Ciążyńska et al. [4]	Multicenter retrospective	181 BSC	Older age, higher risk of second NMSC; outcomes resemble high-risk	Predominantly facial tumors	BSC patients need long-term surveillance; epidemiology close to

			BCC		high-risk BCC.
Shuklam & Khachemoune [27]	Review with case summaries	Literature	Summarizes recurrence ~12–51%; metastasis 5–10%	Histopathology key to diagnosis	BSC is underrecognized; should be managed like high-risk tumor.
Fotiadou et al. [2]	Commentary with data synthesis	Literature synthesis			Reinforces BSC's intermediate behavior between BCC and SCC; stresses close follow-up.
Gualdi et al. [5]	Retrospective clinicopathological	43 BSC	Higher recurrence risk than low-risk BCC	Histology: keratinization plus basal proliferation	BSC is a distinct keratinizing tumor, requiring wider margins.
Murgia et al. [27]	Review + clinicopathological	Narrative + 12 BSC cases	Mixed outcomes, some advanced/metastatic	Novel imaging (confocal, dermoscopy) discussed	BSC requires combined imaging/histology for diagnosis; highlights therapy advances.

3.2 Clinical Outcomes

Retrospective cohorts consistently demonstrated that BSC conveys a higher risk of recurrence and metastasis than BCC, though somewhat less than SCC. Recurrence rates ranged from 4.5% to 14%, and metastasis was reported in 3% to 5.6% of patients (Figure 2). Key predictors included incomplete excision, deep tissue invasion, ear involvement, and perineural invasion. Oldbury et al. showed no recurrences when adequate surgical margins were achieved, underscoring the importance of complete excision.

Figure 2: Clinical Outcomes of BSC Compared with BCC and SCC



3.3 Imaging and Dermoscopic Findings

Dermoscopy and imaging consistently revealed hybrid features combining those of BCC and SCC. Arborizing vessels, blue-gray blotches, and ulceration were observed alongside keratin masses and white opaque areas (Table 2). Reflectance confocal microscopy (Murgia et al., 2023) further highlighted the hybrid cellular morphology.

Table 2: Imaging and Dermoscopic Features of BSC

Study	Imaging Method	BCC-like Features	SCC-like Features	Distinctive BSC Clues
Giacomel et al. [10]	Dermoscopy	Arborizing vessels, blue-gray blotches	Keratin crusts, ulceration	Simultaneous features
Akay et al. [11]	Dermoscopy	Branched vessels	Keratin masses, white opaque areas	Polymorphous vessel patterns
Murgia et al. [28]	Dermoscopy + Confocal	Vascular patterns	Keratin pearls	Hybrid confocal signature

3.4 Histopathological Features

Histopathology confirmed dual differentiation, with infiltrative basal growth merging into squamous keratinization Table 3. Aggressive features included perineural invasion, vessel infiltration, and deep tissue spread.

Table 3: Histopathological Characteristics of BSC

Study	Histological Features	Aggressive Indicators
Betti et al. [3]	Mixed basal & squamous differentiation	High positive margin rate
Wermker et al.[25]	Deep tissue invasion	Muscle/vessel infiltration
Gualdi et al.[5]	Keratinization	Higher recurrence risk
Shukla & Khachemoune [27]	Diagnostic review	Perineural invasion

3.5 Treatment Approaches and Prognosis

Both Mohs micrographic surgery and standard excision were effective when adequate margins were achieved. Allen et al. highlighted the benefit of Mohs in achieving clear margins, while Oldbury et al. found standard excision with sufficient margins equally effective (Table 4). Narrative reviews supported aggressive management and long-term surveillance.

Table 4: Treatment Modalities and Outcomes

Study	Treatment	Outcomes	Recommendation
Allen et al. [22]	Mohs surgery	Low recurrence, no metastasis	Mohs effective for margin control
Oldbury et al. [26]	Standard excision	0 recurrences	Adequate margins curative
Tan et al. [1]	Literature synthesis	Recurrence 12–51%	Treat as high-risk
Shukla & Khachemoune [27]	Review	Recurrence 12–51%, metastasis 5–10%	Aggressive management warranted

3.6 Epidemiology and Risk Factors

BSC predominantly affected older individuals, with a slight male predominance. The head and neck region was the most common tumor site (Table 5). Risk factors for adverse outcomes included tumor size, depth, ear location, incomplete excision, and perineural invasion.

Table 5. Epidemiological Characteristics and Risk Factors

Study	Mean Age	Gender	Common Site	Risk Factors
Betti et al. [3]	74.7	M > F	Head/neck	Positive margins
Wermker et al. [25]	72	M > F	Ear, face	Muscle/vessel invasion

Ciążyńska et al. [4]	Older vs BCC	M > F	Nose, cheek	Multiple NMSC risk
Gualdi et al. [5]	60–75	Equal	Head/neck	Keratinizing features

3.7 Quality Assessment

Cohort and case series studies were generally rated as moderate to high quality using the Newcastle–Ottawa Scale or JBI checklists, although most were retrospective and limited by sample size Table 6. Imaging studies were moderate quality, while narrative reviews were not formally appraised but provided context.

Table 6: Risk of Bias and Quality Assessment

Study	Design	Risk of Bias
Allen et al. [22]	Retrospective cohort	Moderate
Betti et al. [3]	Retrospective cohort	Moderate
Wermker et al. [25]	Retrospective cohort	Moderate–high
Oldbury et al. [26]	Retrospective cohort	Moderate
Ciążyńska et al. [3]	Multicenter retrospective	High
Giacomel et al. [10]	Case series	Moderate
Akay et al. [11]	Case series	Moderate
Kececi et al. [24]	Case series	Moderate
Tan et al. [1]	Narrative review	Not appraised
Shukla & Khachemoune [27]	Narrative review	Not appraised
Fotiadou et al. [2]	Narrative review	Not appraised

3.8 Summary of Results

BSC displays a clinical course more aggressive than BCC and closer to SCC. Recurrence rates ranged from 4.5–14%, and metastasis was reported in 3–5.6% of cases. Imaging and dermoscopy consistently reveal overlapping features of BCC and SCC, while histopathology confirms its dual nature with aggressive tendencies, such as perineural invasion. Excellent control is achieved through adequate surgical excision, including Mohs micrographic surgery. BSC epidemiologically impacts older patients, occurs most frequently in sun-exposed head and neck areas, and has a high risk of developing skin cancers. These results highlight the importance of high-risk management and close follow-up care.

4. DISCUSSION

This systematic review provides a synthesis of the clinical outcomes and imaging findings of BSC versus BCC and SCC. This review confirms BSC as a biologically unique and clinically aggressive keratinocyte carcinoma by summarizing the evidence between 2010-2025. The metastatic and recurrence patterns, therapies and the development of diagnostics and the role of the management of BSC within the framework of other oncologic and dermatologic systems are highlighted.

The results indicate the more aggressive connotation of BSC that was always found more recurrent and metastatic than BCC. Wermker et al. (2015) have shown that invasion into the muscle or vessels to the deepest was associated with relapse and nodal spread, unlike BCC [25]. Similarly, Oldbury et al. (2018) added that although good excision may provide excellent disease control, it is a strong indicator of recurrence in incomplete margins [26]. The data concurs with the prognostic models of oral and cutaneous SCC, in which tumour depth, perineural invasion and anatomic location have been identified to have an impact on survival (Gonzalez-Ruiz et al., 2025)[29]. Together, this information positions BSC in a group of high-risk keratinocyte carcinomas to be followed up and actively treated early.

The optimal treatment of BSC remains contentious, but margin-controlled methods are always the best choice. Allen et al. have noted highly satisfactory clearance rates with negligible recurrence with Mohs micrographic surgery (MMS), particularly in high-risk sites like the head and neck [22]. Supplementing this, Oldbury et al. demonstrated that normal

wide excision was also curative as long as sufficient margins were obtained [26]. These findings are further supported by meta-analyses in BCC, in which previous therapy and insufficient excision were significantly associated with a higher recurrence after MMS (Sooksamran et al.,[30]. Thus, although both MMS and wide excision are valid, careful surgical planning and histologic margin control are of paramount importance.

Emerging systemic therapies are also informative of future approaches. The NCCN Oncology Research Program has featured innovative phase I/II trials of immunotherapies and targeted agents in keratinocyte carcinomas that will potentially expand to BSC (Phase I & II Highlights, 2013)[31]. Although not yet directly studied in BSC, based on lessons learned in advanced BCC and SCC, there is potential for the use of hedgehog inhibitors and checkpoint blockade in select refractory cases.

Accurate diagnosis of BSC still relies on histopathology, but adjunctive tools are gaining importance. Murgia et al. (2023) have pointed out the importance of confocal microscopy in identifying hybrid morphological signatures linking BCC and SCC patterns[28]. Such non-invasive imaging can help clinicians suspect BSC preoperatively to ensure appropriate biopsy and treatment planning. While diagnostic innovations in other types of cancer, such as improved CT staging in colon carcinoma (Shkurti et al., 2023), highlight the usefulness of imaging integration, in BSC this has a limited role as early investigational tools [32]. Nonetheless, with the maturation of multimodal imaging technologies, their use in dermatologic oncology is likely to grow.

Histopathological analyses confirm the dual differentiation of BSC, but immunohistochemistry and molecular studies provide more information. Wendroth et al. (2015) showed the diagnostic value of GATA3 expression to differentiate epithelial malignancies, adding to the promise of biomarker panels in challenging cutaneous differentials. Similarly, Antonyan et al. (2018) highlighted the importance of standardisation in biopsy and specimen processing, which is a way to reduce diagnostic variability. These results support the drive toward harmonized pathology protocols in rare tumors such as BSC.

Molecular research in BCC and SCC is providing increasing information about BSC biology. Gupta et al. (2021) and Paller et al. (2020), while addressing therapeutic interventions in other dermatologic diseases, point out the accelerated nature of translational dermatology[35,36]]. By analogy, the integration of molecular and immunologic information into BSC will likely lead the way to more targeted treatment paradigms.

Perineural invasion is an important prognostic indicator. Abushukur et al. (2022) described poor outcomes in BCC with perineural spread, and similar trends are likely to be more pronounced in BSC [37]. The increased rates of recurrence and metastasis in BSC cohorts highlight the importance of anticipating and identifying perineural invasion by imaging and pathology. This has implications for surgical planning such that deeper or wider resections may be indicated in high-risk anatomical locations such as the ear and periorbital regions (Wermker et al., 2015) [25].

While there is a paucity of specific data for BSC, some perspective can be gained from extrapolation from other areas of surgical oncology. Neuwirth et al. (2022) showed the importance of meticulous surgical techniques in reducing morbidity in the reconstructive setting, supporting the importance of precision surgery for high-risk cutaneous malignancies [38]. Brumbaugh et al. (2022) put into perspective the potential effects of workforce shortages in dermatology on the timely diagnosis and management of rare cancers such as BSC, especially in underserved areas[39]. Solving such systemic problems will be key to achieving equitable access to the best care.

The current evidence base for BSC is limited by small cohorts, retrospective designs and heterogeneous definitions. Nonetheless, there are consistent themes: recurrence risk is greater than BCC, surgical margins are critical to prognosis, and hybrid dermoscopic or histologic features complicate diagnosis. The combination of molecular and imaging advances, as illustrated by Murgia et al. (2023), seems to promise early detection and more personalised therapy[28].

Future priorities should include multicenter registries to capture larger cohorts of patients, prospective trials of MMS vs wide excision, and translational studies of actionable molecular targets. Furthermore, the lessons from NCCN-supported clinical trials in keratinocyte carcinomas (Phase I & II Highlights, 2013) offer a roadmap for opening up therapeutic horizons in BSC [31].

5. CONCLUSION

This systematic review shows that BSC is a rare but clinically important keratinocyte carcinoma with an aggressiveness that falls between BCC and SCC. Although rare in incidence, its recurrence rates, between 4.5 and 14%, and its metastatic potential, described in up to 5.6% of cases, highlight the importance of classifying BSC in high-risk categories. These results emphasise the need to consider BSC not as a simple histological anomaly, but as a clinically significant object that requires special care. The combination of histopathological identification of the dual differentiation with dermoscopic and imaging supplements such as reflectance confocal microscopy is best in obtaining definitive diagnosis. These adjuncts augment the preoperative suspicion and directed biopsy of the indeterminate lesions in which BSC mimics either BCC or SCC alone. Immunohistochemistry also assists in the case of uncertainty and can be used to back the idea of BSC being a hybrid carcinoma. Adequacy of excision is important in the prognosis of the therapy. Both Mohs micrographic surgery and

wide excision have been shown to be effective in the long-term control of the disease when a clear margin is obtained, and partial excision greatly increases the chances of recurrence. Violent surgical design and prolonged follow-ups are therefore a must. Molecular profiling and multicenter cooperation will be needed in the future to understand the biology of BSC better and to explore new targeted treatment. Ultimately, the best hope of improving patient outcomes is a management framework of high-risk carcinoma and close monitoring.

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