Volume 4, Issue 1, January 2026 ISSN (E): 2938-3765

CLINICAL PROGRESSION OF ONYCHOGRYPOSIS IN GERIATRIC POPULATIONS: A LONGITUDINAL OBSERVATIONAL STUDY

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Abstract
Onychogryposis is a progressive nail disorder in elderly patients, marked by nail thickening and curvature that reduces mobility and quality of life. This 18-month observational study of 127 geriatric patients in Uzbekistan assessed clinical features and treatment outcomes. Most patients showed bilateral involvement, frequent infections, and significant pain with mobility limitations. Combined mechanical debridement and antifungal therapy was more effective than conservative treatment. Early diagnosis and intervention are essential to prevent functional decline in older adults.

Keywords: Onychogryposis, geriatric dermatology, nail dystrophy, elderly patients, progressive deformity, podiatric complications, hyperkeratosis, onychodystrophy.

Introduction

The aging process brings profound alterations to integumentary structures, with nail apparatus changes representing one of the most visible yet frequently overlooked manifestations of senescence. Onychogryposis, colloquially termed ram's horn nail due to its characteristic appearance, emerges as a particularly debilitating condition within geriatric populations. Unlike simple age-related nail thickening, this pathology involves complex structural deformation that progressively worsens without intervention. The condition typically affects toenails, particularly the hallux, though cases involving multiple digits have been documented with increasing frequency in clinical practice. Beyond cosmetic concerns, patients experience substantial physical discomfort that cascades into mobility restrictions, balance impairment, and heightened fall risk. Despite its prevalence among elderly individuals, systematic investigation into disease progression patterns remains surprisingly limited. Existing literature provides fragmented insights, rarely documenting the natural history across extended observation periods. This gap becomes particularly problematic when clinicians attempt to counsel patients about prognosis or when formulating evidence-based treatment protocols. The present investigation addresses this deficiency through longitudinal tracking of disease evolution, quantifying morphological changes, documenting complication rates, and evaluating intervention efficacy in a well-characterized geriatric cohort.

Literature Review

Karimov and colleagues examined nail pathologies in 340 elderly Uzbek patients, identifying onychogryposis in 23% of subjects with higher prevalence among those with diabetes mellitus and peripheral vascular disease. Their work established baseline epidemiological data but lacked

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longitudinal follow-up to assess progression trajectories. Ivanov's comprehensive Russian dermatology textbook describes onychogryposis as resulting from cumulative microtrauma, fungal infection, and circulatory insufficiency, though specific progression metrics remain absent from his analysis. Rashidova's study of 156 geriatric patients in Tashkent documented association between ill-fitting footwear and accelerated nail deformity, with 67% of affected individuals reporting chronic use of narrow toe-box shoes. Petrov and Smirnov investigated histopathological changes in hypertrophic nails, revealing disrupted keratinization patterns and increased collagen deposition within the nail bed, providing cellular-level insights into macroscopic deformity. Azimov's clinical observations across five years noted spontaneous improvement in fewer than 8% of untreated cases, underscoring the progressive nature of this condition and highlighting the imperative for active management strategies in affected populations.

Methodology

This prospective observational study enrolled consecutive patients aged 65 years and older presenting with diagnosed onychogryposis at dermatology and podiatry clinics in Tashkent, Samarkand, and Bukhara between March 2022 and September 2023. Inclusion criteria specified clinical diagnosis of onychogryposis affecting at least one toenail with minimum thickness of 2mm measured by digital caliper, absence of active malignancy, and patient willingness to attend scheduled follow-up appointments. Exclusion criteria eliminated individuals with severe cognitive impairment preventing reliable symptom reporting, those receiving ongoing chemotherapy or immunosuppressive therapy, and patients with diagnosed psoriasis or lichen planus affecting nail structures. Of 183 initially screened individuals, 127 met eligibility requirements and provided informed consent following institutional review board approval. Clinical examination protocols required standardized assessments at baseline, six months, twelve months, and eighteen months. Trained examiners measured nail plate thickness at the midpoint using Mitutoyo digital calipers calibrated to 0.01mm precision. Curvature angle quantification employed photographic documentation with protractor overlay analysis performed by two independent observers, with discrepancies resolved through consensus review. Pain assessment utilized numerical rating scales ranging from zero to ten, administered during rest and ambulation conditions. Functional impact evaluation incorporated the Foot Function Index, a validated 23-item questionnaire examining pain, disability, and activity limitation domains. Laboratory investigations included fungal culture specimens obtained through nail clipping submitted for sabouraud dextrose agar culture with species identification. Bacterial cultures were processed when clinical signs suggested secondary infection, specifically erythema, purulent drainage, or localized warmth. Complete blood counts, fasting glucose, hemoglobin A1c, and lipid panels characterized metabolic status given known associations between systemic disease and nail pathology. Treatment allocation followed a stepped approach rather than randomization, reflecting real-world clinical practice patterns. Initial management consisted of mechanical debridement performed by trained podiatrists using electric rotary instruments, repeated at six to eight week intervals based on regrowth patterns. Topical antifungal therapy with ciclopirox 8% lacquer or amorolfine 5% solution was prescribed when mycological examination confirmed fungal colonization. Systemic antifungal therapy employing terbinafine 250mg daily for twelve weeks was reserved for cases demonstrating matrix involvement or treatment resistance to topical agents.

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Patients received standardized footwear counseling emphasizing proper toe-box dimensions, cushioned insoles, and avoidance of constrictive hosiery.

Statistical analysis employed SPSS version 26.0 with descriptive statistics characterizing baseline demographics and clinical features. Continuous variables were expressed as means with standard deviations or medians with interquartile ranges depending on distribution normality assessed through Shapiro-Wilk testing. Categorical variables utilized frequency distributions with percentages. Progression analysis compared baseline and follow-up measurements through paired t-tests for normally distributed data or Wilcoxon signed-rank tests for non-normal distributions. Treatment efficacy comparisons employed chi-square tests for categorical outcomes and analysis of variance for continuous measures. Statistical significance threshold was established at p less than 0.05 with two-tailed testing throughout.

Results

The study cohort comprised 127 patients with mean age 76.4 years, ranging from 68 to 89 years, including 73 females and 54 males reflecting the gender distribution typical of geriatric clinic populations. Diabetes mellitus affected 48 patients representing 37.8% of the sample, while peripheral arterial disease was documented in 31 patients or 24.4%. Hypertension prevalence reached 82.7% with 105 affected individuals, and 29 patients comprising 22.8% reported previous stroke or transient ischemic events. Body mass index averaged 28.3 kg/m², with 67.7% classified as overweight or obese. Clinical examination revealed bilateral onychogryposis in 86 patients totaling 67.7% of cases, while unilateral involvement affected 41 individuals. The hallux represented the most frequently involved digit in 118 patients or 92.9%, followed by second toe involvement in 34 patients representing 26.8%. Baseline nail thickness measurements demonstrated mean values of 3.8mm with standard deviation of 1.4mm, median 3.5mm, and interquartile range spanning 2.8mm to 4.6mm. Maximum recorded thickness reached 7.4mm in a 84-year-old male with twenty-year disease duration. Curvature angles averaged 48.6 degrees, ranging from 22 degrees to 91 degrees, with greater deformity correlating significantly with longer disease duration, showing Pearson correlation coefficient of 0.67 and p-value below 0.001. Pain scores at baseline averaged 6.2 out of ten during ambulation and 3.8 during rest, representing substantial symptomatic burden. Foot Function Index scores revealed mean disability subscale values of 54.3 out of 100, indicating moderate to severe functional impairment. Mobility limitations were reported by 93 patients representing 73.2%, with 41 individuals or 32.3% describing fear of falling attributed directly to nail-related discomfort affecting gait patterns. Mycological examination identified fungal colonization in 81 patients totaling 63.8%, with Trichophyton rubrum representing the predominant species in 52 cases or 64.2% of positive cultures. Candida species appeared in 18 cultures representing 22.2%, while mixed fungal infections affected 11 patients or 13.6%. Bacterial superinfection developed in 53 patients comprising 41.7% during the observation period, with Staphylococcus aureus isolated in 31 cases representing 58.5% of bacterial infections and Pseudomonas aeruginosa in 14 cases or 26.4%.

Longitudinal measurements revealed progressive worsening in untreated or minimally treated cases. At six months, patients not receiving regular podiatric care demonstrated mean thickness increases of 0.4mm, progressing to 0.9mm increase at twelve months and 1.3mm increase by eighteen months compared to baseline. Curvature angles similarly deteriorated, showing mean increases of 7.2 degrees

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at six months, 14.8 degrees at twelve months, and 19.4 degrees at eighteen months in the absence of intervention. Treatment outcomes varied substantially by modality and adherence patterns. Among 82 patients receiving regular mechanical debridement at six to eight week intervals, 52 individuals or 63.4% reported sustained symptom relief with pain score reductions averaging 3.1 points. Topical antifungal therapy combined with debridement produced mycological clearance in 37 of 58 treated patients representing 63.8% efficacy, though clinical improvement often preceded laboratory confirmation. Systemic antifungal therapy prescribed to 24 patients with refractory cases achieved mycological cure in 18 individuals totaling 75%, with clinical improvement noted in 20 cases representing 83.3%. Complications during the study period included cellulitis development in 12 patients or 9.4%, requiring systemic antibiotic therapy and resulting in hospitalization for 4 individuals. One patient experienced osteomyelitis of the distal phalanx necessitating partial toe amputation. Treatment discontinuation occurred in 19 patients representing 15%, primarily due to transportation difficulties accessing podiatric services rather than treatment intolerance.

Discussion

These findings illuminate several critical aspects of onychogryposis natural history and management in geriatric populations that merit careful consideration. The progressive nature of untreated disease, with thickness increases averaging 1.3mm over eighteen months, confirms clinical impressions that watchful waiting represents an inadequate strategy. More concerning are the functional consequences documented through validated instruments, with nearly three-quarters of patients experiencing mobility limitations that extend beyond mere discomfort to encompass genuine disability and fall risk. The high prevalence of fungal colonization at 63.8% raises questions about pathogenic mechanisms. Rather than viewing onychogryposis and onychomycosis as distinct entities, the data suggest overlapping processes where structural deformity creates microenvironments conducive to fungal proliferation while fungal infection potentially accelerates dystrophic changes through inflammatory mediators. This bidirectional relationship has practical implications, as antifungal therapy alone rarely corrects mechanical deformity, yet mechanical treatments without addressing fungal burden often yield suboptimal outcomes. The integrated approach combining debridement with antimycotic agents demonstrated superior results compared to either modality alone, supporting current best practice recommendations. Bacterial superinfection emerged as a frequent complication affecting over 40% of patients, substantially exceeding rates reported in younger populations with isolated onychomycosis. This vulnerability likely reflects multiple factors including compromised perfusion in aged tissues, delayed healing capacity, and mechanical trauma from ill-fitting footwear that creates portals for bacterial entry. The identification of both Staphylococcus and Pseudomonas species has antimicrobial stewardship implications, as empiric therapy selections must account for gram-positive and gram-negative coverage in this population. The association between systemic comorbidities and disease severity deserves emphasis. Diabetic patients exhibited significantly thicker nails and greater curvature deformity compared to non-diabetic counterparts, consistent with known effects of hyperglycemia on collagen cross-linking and keratinocyte function. Similarly, peripheral arterial disease correlated with treatment resistance, presumably reflecting inadequate tissue oxygen delivery necessary for healing responses. These observations underscore the importance of comprehensive medical optimization rather than isolated podiatric interventions.

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Treatment adherence emerged as a major challenge, with 15% discontinuation rates driven primarily by access barriers rather than therapy-related factors. This finding highlights systemic healthcare delivery issues affecting geriatric populations, particularly those in regional cities with limited podiatric resources. Mobile podiatric services or training of primary care providers in basic nail debridement techniques might expand access and improve outcomes for geographically isolated elderly individuals.

The study has limitations requiring acknowledgment. Single-country enrollment restricts generalizability to populations with different genetic backgrounds, dietary patterns, and healthcare systems. The observational design without randomization introduces potential selection bias and confounding, though ethical constraints preclude withholding treatment from symptomatic elderly patients. Loss to follow-up affected 14 patients representing 11%, potentially introducing attrition bias if these individuals differed systematically from completers. Finally, the eighteen-month observation window, while revealing progressive trends, may inadequately capture the full spectrum of long-term outcomes spanning years or decades.

Onychogryposis in geriatric patients follows a progressive deterioration pattern resulting in substantial functional impairment when left untreated. Regular mechanical debridement combined with antifungal therapy when indicated provides effective symptom control and prevents complications in the majority of patients. Early identification and consistent podiatric management should constitute standard care for elderly individuals with this condition.

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