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BURNS

Case Series

ADULT BURN CONTRACTURE RECONSTRUCTIONS CAUSED BY BURN INJURY DURING CHILDHOOD: PATIENTS' QUALITY OF LIFE AND SURGICAL CHALLENGES

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ABSTRACT

Introduction: In many low- and middle-income countries (LMICs), childhood burns continue to be common, and contractures that persist into adulthood lead to significant disability. Observational studies suggest that health-related quality of life (HRQoL) generally improves over time in adult burn survivors; however, individuals with burn-scar contractures experience greater disability and lower HRQoL.
Method: Descriptive, single-centre case series. Four adults with longstanding contractures from childhood flame burns were identified: postoperative qualitative HRQoL data (unstructured interviews). Surgical techniques and outcomes were recorded from clinical notes and photographs.
Results: Growth through the scar caused multilevel deformities (bone/joint, tendon, soft tissue). Staged surgery included: (i) wrist/hand contracture release with ligament stabilisation, K-wire fixation, and tendon lengthening; (ii) multistage auricular reconstruction using a costal-cartilage framework covered by a pedicled temporoparietal fascial flap (TPFF) and ultrathin scalp skin graft; (iii) trunk/inguinoperineal release with abdominoplasty-style umbilical and nipple-areola complex (NAC) repositioning, and pedicled latissimus dorsi myocutaneous (LD-MC) flap; and (iv) staged regional reconstruction following oncologic resection of squamous-cell carcinoma (SCC) arising in a burn scar. In all cases, daily function and psychosocial well-being improved, and patients returned to work, demonstrating strong motivation for staged procedures.
Conclusion: Even when reconstruction is delayed until adulthood, focusing on high-impact functional goals in a staged plan produces meaningful HRQoL improvements for survivors of childhood flame burns in resource-constrained settings.
***Key Words**: Burn contracture; Quality of life; Adult reconstruction; Temporoparietal fascial flap; Costal cartilage*

Pendahuluan: Di banyak negara berpenghasilan rendah dan menengah (low- and middle-income countries/LMICs), luka bakar pada masa kanak-kanak masih sering terjadi, dan kontraktur yang menetap hingga usia dewasa menyebabkan disabilitas yang signifikan. Studi observasional menunjukkan bahwa kualitas hidup terkait kesehatan (health-related quality of life/HRQoL) umumnya membaik seiring waktu pada penyintas luka bakar dewasa; namun, individu dengan kontraktur jaringan parut akibat luka bakar mengalami disabilitas yang lebih berat dan HRQoL yang lebih rendah.
Metode: Seri kasus deskriptif di satu pusat layanan kesehatan. Empat orang dewasa dengan kontraktur jangka panjang akibat luka bakar api pada masa kanak-kanak diidentifikasi; data HRQoL kualitatif pascaoperasi diperoleh melalui wawancara tidak terstruktur. Teknik pembedahan dan luarannya dicatat dari catatan klinis dan dokumentasi fotografi.
Hasil: Pertumbuhan melalui jaringan parut menyebabkan deformitas multilevel (tulang/sendi, tendon, jaringan lunak). Pembedahan bertahap meliputi: (i) pelepasan kontraktur pergelangan tangan dan tangan disertai stabilisasi ligamen, fiksasi K-wire, dan pemanjangan tendon; (ii) rekonstruksi aurikula multitahap menggunakan kerangka kartilago kosta yang ditutup dengan flap fasia temporoparietal (temporoparietal fascial flap/TPFF) bertangkai dan cangkok kulit tipis dari kulit kepala; (iii) pelepasan kontraktur trunkus dan inguinoperineal dengan reposisi umbilikus gaya abdominoplasti dan kompleks puting-areola (nipple-areola complex/NAC), serta flap miokutan latissimus dorsi (latissimus dorsi myocutaneous/LD-MC) bertangkai; dan (iv) rekonstruksi regional bertahap pascareseksi onkologis karsinoma sel skuamosa (squamous-cell carcinoma/SCC) yang timbul pada jaringan parut luka bakar. Pada seluruh kasus, fungsi harian dan kesejahteraan psikososial mengalami perbaikan, dan pasien kembali bekerja, menunjukkan motivasi yang kuat untuk menjalani prosedur bertahap.

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Simpulan: Meskipun rekonstruksi ditunda hingga usia dewasa, pendekatan yang berfokus pada tujuan fungsional berdampak tinggi dalam rencana bertahap menghasilkan perbaikan HRQoL yang bermakna bagi penyintas luka bakar api pada masa kanak-kanak di lingkungan dengan keterbatasan sumber daya.
Kata Kunci: Kontraktur luka bakar; Kualitas hidup; Rekonstruksi dewasa; Flap fasia temporoparietal; Kartilago kosta

Conflicts of Interest Statement:
The authors declare no conflicts of interest.

INTRODUCTION

Burns are a major global health problem, with the highest mortality and disability burden in LMICs; non-fatal burns frequently cause disfigurement and lifelong functional limitations.[1] Within adult burn populations, HRQoL generally improves across the long term, but domains such as pain, physical role participation, and work may remain impaired years after injury.[2,3] Burn-scar contractures disproportionately drive disability and lower HRQoL, underscoring the importance of timely access to safe burn care to prevent contracture formation—an access gap that remains pronounced in many LMICs.[4]

For adults who reach maturity with untreated or inadequately treated childhood burns, reconstruction is complicated by "growth-through-scar" effects—bony malalignment, tendon shortening, soft-tissue deficiency, and regional malposition—necessitating staged, function-first strategies. Evidence from LMIC cohorts shows that contracture release and reconstruction can improve range of motion (ROM), disability (e.g., WHODAS), and HRQoL (EQ-5D).[5] Specific subunit solutions are well described: in post-burn auricular deformity, TPFF provides thin, pliable, well-vascularized coverage for costal-cartilage frameworks in scarred beds; large series and reviews support its reliability.[6-8] For trunk and thoracic wall defects after contracture release or oncologic resection in scarred fields, pedicled LD-MC flaps (including V-Y advancement variants) offer durable soft-tissue coverage with acceptable donor morbidity.[9]

Against this backdrop, we report a single-center Indonesian case-series of adults presenting with burn contractures from childhood flame injuries, focusing on qualitative HRQoL trajectories and staged reconstructive decision-making in a resource-constrained context. All clinical details and operative images are drawn from the source presentation.

METHOD

Design and Setting

Descriptive case-series at RS Ngoerah Hospital/ Udayana University, Denpasar, Indonesia.

Participants and Data

Four adults with major burn-scar contractures arising from childhood flame burns were identified: Pre- and postoperative qualitative HRQoL data from unstructured interviews (growth/anatomical changes, functional limitations, psychosocial impact, motivations and priorities for surgery). Operative techniques and outcomes were compiled from records and photographs.

Outcomes

HRQoL narratives (education/work, social participation, affect, motivation for further stages) and functional observations (e.g., ROM, hand use, wound/inflammation control).

Ethics

All patients provided written informed consent for treatment and for the publication of de-identified clinical information and images; ethics statements and permissions were obtained directly from the patients.

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RESULTS

We identified six adults presenting with long-standing burn-scar contractures from childhood flame injuries; four had sufficiently complete qualitative HRQoL information from unstructured interviews. Injuries typically occurred between the ages of 3 and 9 years, and most detailed cases were female. All four had experienced delays to definitive care due to low income, transportation barriers, and limited health knowledge, leading to prolonged adaptation to deformity into adulthood. Growth proceeded to the expected stature, but "growth-through-scar" produced multi-level structural changes, including bone and joint deformity, tendon shortening, compartmentalisation/bulging of subcutaneous fat due to an inelastic scar, restricted breast growth, and umbilical malposition. Psychosocial baselines varied from social withdrawal (one patient living in a Balinese priest ashram) to pragmatic acceptance and continued participation in work and family life despite limitations.

Table 1. Other conditions related to hypospadias

Case	Sex	Current age	Age at burn	Mechanism	Involved regions	Preoperative HRQoL snapshot
1	F	24	4	Flame	Hand/wrist	Left junior high school; helped parents as farmer; unmarried
2	F	23	3	Flame	Hand, neck, ear	Social withdrawal; lived in Balinese priest ashram
3	F	45	9	Flame	Trunk, pelvis, thigh	Shop owner; referred for inflamed abdominal scar
4	F	65	3	Flame	Neck, chest, Laxilla	Farmer; married; 3 children; SCC in scar

Preoperative Function and HRQoL Themes

Across the series, patients described adapting daily routines to non-functional or restricted limbs and tethered trunk/neck skin, often with recurrent scar inflammation or ulceration in high-tension areas. Several reported interrupted education (e.g., discontinuing junior high school) or restricted employment opportunities before reconstruction, while family support was consistently present. The interview prompts captured functional (ROM, hand use, neck extension), psychosocial (stigma, withdrawal, acceptance), and motivational domains that later informed stage prioritisation.

Operative Strategies and Anatomical Findings

Surgical plans emphasised function-first staging to deliver an early, visible "win" and build confidence for subsequent procedures. Techniques spanned:

(1) Upper-extremity contracture release with ligament stabilisation, temporary K-wire fixation, and tendon lengthening (hand/wrist).
(2) Multistage auricular reconstruction using contralateral costal cartilage frameworks combined with a pedicled temporoparietal fascial flap (TPFF) and ultrathin scalp skin graft (UTSG).
(3) Extensive trunk/inguinoperineal releases with abdominoplasty-style umbilical repositioning, coordinated breast/NAC repositioning, and pedicled latissimus dorsi myocutaneous (LD-MC) flap resurfacing.
(4) Staged regional flaps after oncologic resection for SCC in a burn scar, to restore neck extension and axillary/shoulder mobility.

Case Vignettes

Case 1 (F, 24 years)

An injury at age 4 resulted in a non-functional hand with wrist hyperextension, an undefined radioulnar joint, and a preserved epiphyseal plate. Radiographs highlight the abnormal alignment compared to a normal wrist X-ray shown for contrast. Preoperatively, she attended junior high school, engaged only in informal farm work, and remained unmarried. The surgical procedure involved a comprehensive contracture release, ligament

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stabilisation, K-wire fixation, and tendon lengthening to restore alignment and range of motion (See Figure 1).

After skeletal stabilisation, a free flap was harvested from the anterolateral thigh (ALT) and transferred for durable soft-tissue coverage of the exposed structures. The flap provided well-vascularised tissue to cover the defect while maintaining enough pliability for future functional movement of the wrist and fingers. Microvascular anastomosis was performed with recipient vessels at the wrist, and the flap was inset to restore contour and protect the underlying reconstructed tendons and joints. By six and twelve months post-operation, progressive improvements were visually documented: enhanced grip and active finger movement, return to work, and improved mood with a clear willingness for further surgery. The note on flap thinning indicates secondary contour optimisation to enhance hand function and hygiene.

Figure 1. Preoperative and postoperative case 1

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Case 2 (F, 23 years)

Burn at age 3 resulted in loss of posterior helix, antihelix, and lobule with fusion to retroauricular scar, along with neck contracture; she withdrew socially and lived in a Balinese priest ashram. After preliminary forearm skin grafting and neck Z-plasty with serial triamcinolone for hypertrophic scar, the ear was reconstructed in two stages: Stage 1 preserved conchal skin/cartilage, carved a costal cartilage framework (helical rim with anterior/posterior crura) from the contralateral chest, and implanted it into a continuous posterior pocket with a helical bolster to maintain contour. Stage 2 elevated the framework and inset a pedicled TPFF based on the parietal branch of the superficial temporal system, then covered it with UTSG harvested from the parieto-occipital scalp, producing stable, thin coverage suitable for fine auricular definition. At follow-up, the patient reported employment as a tailor, financial support for her family, and improved happiness, with serial neck steroid injections continued every 4 weeks for one year to modulate hypertrophic scar (see Figure 2).

Figure 2. Preoperative and postoperative case 2

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Case 3 (F, 45 years)

Sustaining a flame burn at age 9, the patient presented with navel and NAC malposition, constricted breast tissue, hypopigmented scars, and recurrent inflammatory episodes of hypertrophic scar (follicular abscess on intact scar dermis). Figure 3 illustrates skin expansion in non-scarred areas and striking fat bulging/compartmentalisation, where inelastic scar restricted soft-tissue displacement—classic markers of growth against rigid scar planes. Stage 1 involved total scar excision, release of all contracting bands, abdominoplasty-style umbilical repositioning, breast/NAC repositioning, and a pedicled LD-MC flap for durable coverage. By 12–18 months, serial photos document improved contour and scar quality. Stage 2 at 6 months added scar excision, Z-plasty, and fat redistribution to optimise contour and mobility; by 12 months, she reported better activity, cessation of inflammatory episodes, return to work/childcare, and plans to remarry

Figure 3. Preoperative and postoperative case 3

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Case 4 (F, 65 years)

A flame burn at age 3 progressed to neck flexion contracture and left axillary tethering with superimposed chest SCC; despite limitations, she described social acceptance, marriage and breastfeeding, and ongoing farm and household work. Pre-op images on pages 25–26 show restricted neck extension and anterior chest wall distortion around the tumour. Following oncologic management, a two-stage reconstructive plan was undertaken. Stage 1 consisted of wide tumour excision and extensive release of the burn scar contracture across the neck, axilla, and anterior chest wall. The large composite defect was resurfaced using a free deep inferior epigastric perforator (DIEP) flap harvested from the lower abdomen, providing a well-vascularized and pliable skin paddle suitable for restoring cervical extension and anterior chest contour. Microvascular anastomosis was performed to the recipient vessels in the neck region, and the flap was inset to allow improved shoulder abduction. Intra-operative photos demonstrate the wide release and abdominal flap harvest. Stage 2 focused on contour refinement and mobility improvement with additional scar release and local tissue rearrangement. At follow-up, serial photos document improved head and arm elevation arcs; she reported a return to farming and household work, greater happiness, and readiness for the next stage of optimisation (see Figure 4).

Figure 4. Preoperative and postoperative case 4

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Postoperative clinical course and qualitative outcomes

Across all four detailed cases, functional recovery and psychosocial gains were consistent and rapid enough to be visually appreciable within months—e.g., hand function at 6–12 months (Case 1), auricular definition with thin, stable coverage and ongoing neck scar modulation (Case 2), contour normalization and cessation of inflammatory flares after staged trunk release and reconstruction (Case 3), and restored neck/shoulder mobility following oncologic reconstruction (Case 4). Patients uniformly reported greater confidence, return to work or expansion of work roles, improved mood, and sustained motivation for further staged procedures when indicated. These qualitative HRQoL trajectories align with the programmatic emphasis on early high-impact stages to build trust and adherence.

Table 2. Operative strategies and postoperative outcomes

Case	Key procedures	Staging	Postoperative function & HRQoL
1	Stage 1: autologous costal-cartilage auricular framework in posterior pocket; helical bolster. Stage 2: pedicled TPFF; ultrathin scalp graft; triamcinolone for neck HS	Two stages	Employed as tailor; supports family; psychosocial improvement
2	Contracture release; wrist ligament stabilization; K-wire fixation; tendon lengthening	Single stage with follow-up	Functional hand; back to work; improved affect
3	Stage 1: total scar excision; umbilical repositioning; NAC repositioning; LD-MC flap. Stage 2: scar excision; Z-plasty; fat redistribution	Two stages (6-month interval)	Improved activity; no recurrent inflammation; return to work/childcare
4	Oncologic resection of SCC; staged regional flaps to neck/chest/axilla	Two stages	Better neck/shoulder motion; back to farm/household work; motivated for next stage

Complications and revisions

No major complications are detailed in the source material. Secondary refinements (e.g., flap thinning in the upper extremity, Z-plasty and fat redistribution in the lower trunk/thigh) were planned elements of staged care rather than unanticipated reoperations. The hypertrophic scar along the neck in Case 2 was managed proactively with serial triamcinolone injections at 4-week intervals over 1 year, consistent with contemporary scar modulation practices.

DISCUSSION

This case series demonstrates that delayed but targeted adult reconstruction can significantly enhance HRQoL and function for survivors living with long-standing contractures from childhood burns. Our observations—such as return to work, improved daily activities, and psychosocial well-being—align with data from LMIC cohorts showing notable improvements in ROM, disability scores, and EQ-5D following contracture release surgery.[5] They also correspond with longitudinal and systematic review evidence indicating that HRQoL generally improves over time in adult burn survivors, although ongoing issues with employment and pain are common—reflected in our patients' pre- and post-operative narratives.[2,4]

Growth through scar tissue often leads to complex deformities affecting skeletal alignment, joint stability, tendons, and soft tissues—necessitating staged plans that focus on the highest functional gains (e.g., hand use, neck extension). Modern algorithms stress releasing all restrictive tissues and resurfacing with the most appropriate options on the reconstructive ladder or elevator, often in stages; our approach aligns with these principles.[10] For the hand, strategies

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such as combined release, temporary stabilisation, tendon lengthening, and structured rehabilitation are standard to achieve functional ranges of motion—approaches exemplified in Case 1.[11] In post-burn auricular reconstruction, large series and reviews support the use of pedicled TPFF to provide vascularised, thin, and stable coverage of an autologous costal cartilage framework in scarred beds, which we refined with an ultrathin scalp graft to improve contour (Case 2).[5,8] For trunk, thoracic, and axillary defects following release or tumour excision in scarred tissues, pedicled LD-MC flaps, including V-Y advancement designs, offer reliable coverage and improved shoulder function, as seen in our Case 3 and Case 4 reconstructions. [9]

The series also highlights the importance of oncological vigilance: malignant degeneration (Marjolin's ulcer, most frequently SCC) can develop in longstanding burn scars after a prolonged latency period; prompt diagnosis, wide excision, and timely reconstruction are advised—principles demonstrated in Case 4.[12] Finally, our patients' initial barriers to care (income, transportation, limited knowledge) reflect wider structural determinants in LMICs; improving timely access to safe acute burn care and rehabilitation remains key to preventing contractures.[3]

Limitations. This is a small, single-centre case series with qualitative HRQoL data obtained from unstructured interviews and without standardised instruments or objective goniometry. Follow-up durations varied, and selection bias may be present. Nonetheless, the consistent patient-reported improvements and functional observations offer real-world, practice-informed signals that complement existing evidence from larger cohorts.

CONCLUSION

In adults living with contractures from childhood flame burns, staged, function-first reconstruction—including hand release with stabilisation, TPFF-based auricular reconstruction, and pedicled LD-MC flaps for trunk/axillary regions—can produce meaningful improvements in daily function and HRQoL, even after decades of adaptation. Early, high-impact "wins" build trust and facilitate adherence to subsequent stages, a particularly valuable strategy in resource-constrained settings.

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