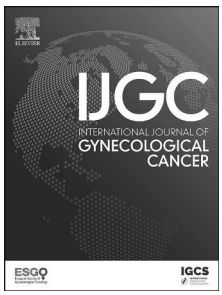
ORIGINAL RESEARCH

Does the prophylactic use of compression garments reduce the risk of lower limb lymphedema after pelvic and/or inguinal lymphadenectomy for gynecological cancer? A systematic review



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ABSTRACT

Objective: Our goal was to assess whether prophylactic compression garments reduce lower-limb lymphedema after pelvic/inguinal lymphadenectomy for gynecologic malignancies.

Methods: Preferred Reporting Items for Systematic Reviews and Meta-Analyses.-based systematic review. Eligible studies included primary interventional studies evaluating prophylactic lower-limb compression after pelvic and/or inguinal lymphadenectomy for gynecological malignancies; systematic/rapid reviews were considered for contextual background and reference checking; studies focused on treatment of established lymphedema or non-relevant populations/outcomes were excluded. The Population, Intervention, Comparison, Outcome question was: in women undergoing pelvic and/or inguinal lymphadenectomy for gynecological malignancy (P), does prophylactic use of compression garments (I), compared with no compression garments or non-compressive preventive strategies (C), reduce the incidence of lower-limb lymphedema (O)? PubMed, Scopus, Cochrane, LILACS, and SciELO were searched from inception through March8 2026, using Medical Subject Headings and free-text terms related to compression garments, lymphedema prevention, pelvic or inguinal lymphadenectomy, gynecological cancer, and lower-limb lymphedema.

Results: A total of 536 full-text reports were assessed; 6 gynecological oncology randomized controlled trials met the Population, Intervention, Comparison, Outcome criteria; one additional mixed-population randomized controlled trial was treated as indirect evidence. Two systematic/rapid reviews were used for contextual background/reference checking; multimodal prevention studies were discussed as evidence for multimodal pathways because compression effects could not be isolated. Randomized controlled trials were heterogeneous: small trials using class I to II stockings did not demonstrate a significant reduction in lower-limb lymphedema, although they suggested a potential benefit. One randomized controlled trial ($n = 64$) showed a reduction in lymphedema incidence (3.4% vs 38.7%) with class II (23-32 mmHg) stockings worn for 12 months, alongside education and physical activity.

Conclusions: Prophylactic compression-particularly early, prolonged class II stockings within structured rehabilitation-was associated with lower lymphedema incidence in some studies; evidence remains limited by small, heterogeneous trials, no meta-analysis, and multimodal interventions where compression effects cannot be isolated.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Secondary lower-limb lymphedema is a frequent and disabling complication after pelvic and/or inguinal lymphadenectomy for gynecological cancer, but evidence on primary prevention with compression garments remains limited and inconsistent.

WHAT THIS STUDY ADDS

Across 6 gynecological oncology randomized controlled trials, effects of prophylactic stockings were heterogeneous: shorter/lower-pressure regimens were generally not associated with statistically significant reductions, whereas one single-center randomized controlled trial ($n = 64$) reported a marked reduction in incidence with 12 months of class II stockings alongside education/physical activity; trials embedding compression within complex decongestive therapy-based multimodal programs showed risk reductions but cannot isolate the independent effect of compression.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

Prophylactic compression should be considered a targeted option for selected high-risk women within structured prevention pathways, while larger multicenter randomized controlled trials with standardized definitions and follow-up are needed before adoption as routine standard of care.

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Stockings; Compression; Lymphedema/Prevention and Control; Lymph Node Excision; Genital Neoplasms; Female; Lower Extremity

ORIGINAL RESEARCH

INTRODUCTION

Lower-limb lymphedema is a complication after pelvic/inguinal lymphadenectomy for gynecological malignancies, frequently combined with radiotherapy.[1,2] Incidence is 10% to 40% depending on dissection, radiotherapy, follow-up, and diagnostic criteria.[3-5] Disease progression requires lifelong rehabilitation.[6,7] Complex Decongestive Therapy is the standard for established lymphedema,[8] but evidence on its preventive use is limited.[9,10] Because this strategy entails cost, discomfort, and sustained adherence, its efficacy and safety require critical appraisal. This systematic review addresses whether prophylactic compression reduces lymphedema risk after pelvic and/or inguinal lymphadenectomy for gynecological malignancies, focusing on incidence, symptoms, quality of life, safety, and feasibility.

METHODS

A systematic review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement principles, with a priori definition of the Population, Intervention, Comparison, Outcome (PICO) question, eligibility criteria, search strategy, study selection process, risk-of-bias assessment, data extraction, and synthesis methods. Although the methodology was defined a priori, the protocol was not prospectively registered (eg, PROSPEctive Register Of systematic reviews [PROSPERO]). The PICO question included adult women undergoing pelvic and/or inguinal lymphadenectomy for gynecological malignancies (population); prophylactic use of medical-grade graduated compression garments for the lower limb (graduated compression stockings, including full-length pantyhose-style stockings, and made-to-measure (custom-made) garments when required for appropriate fit), initiated in the post-operative phase or otherwise before the onset of manifest lymphedema (intervention); no prophylactic compression garments, including usual care (education, surveillance, mobilization) and/or structured non-compressive preventive interventions (eg, education and/or exercise programs) (comparison); primary outcome: incidence of secondary lower-limb lymphedema, as defined in each study (changes in limb volume or circumference, with or without clinical/symptomatic criteria), secondary outcomes: changes in limb volume or circumference; symptoms (heaviness, tension, pain); quality of life; adherence to compression; adverse events (skin complications, wound problems, deep vein thrombosis, treatment discontinuation) (outcome).

Randomized controlled trials conducted in gynecological oncology populations evaluating preventive interventions that included a defined compression component were considered as the core evidence base[11-16]; multimodal programs were interpreted as evidence for prevention pathways and not as isolating compression effects. Systematic/rapid reviews, scoping reviews, and other secondary sources were screened for contextual background and reference checking and were not included in the core evidence base to avoid double counting. Studies enrolling mixed oncology populations without separable gynecological subgroup data were treated as indirect evidence and down-weighted accordingly in the interpretation of findings.

Information Sources and Search Strategy

PubMed, Scopus, and the Cochrane Library were searched without date or language restrictions from inception to March 2026. LILACS (via the Virtual Health Library) and SciELO were also searched to improve Spanish- and Portuguese-language coverage but yielded no additional eligible studies. Free-text and, where available, indexed terms were combined into 5 conceptual groups: "compression garments" OR "compression stockings" OR "compression therapy"; "lymphedema prevention" OR "lymphoedema prevention"; "pelvic lymphadenectomy" OR "Lymph node dissection"; "gynecological cancer" OR "gynaecological cancer"; "lower-limb lymphedema" OR "lower-extremity lymphedema".

Search strings were adapted to each database using Boolean operators (AND/OR). In PubMed, key concepts were mapped to Medical Subject Headings (MeSH) and combined with free-text terms; main descriptors/qualifiers were "Stockings, Compression", "Lymphedema/prevention & control", "Lymph Node Excision", "Genital Neoplasms, Female", and "Lower Extremity". Equivalent keywords were used in Scopus and the Cochrane Library. No language restrictions were applied. Reference lists of included studies and key systematic/scoping reviews[8-10,17] were also screened for additional records. Grey literature and trial registries were not systematically searched. The search identified 5988 records, including 2 from reference checking; after removing 1819 duplicates, 4169 unique records underwent title/abstract screening, and 536 full-text reports were assessed for eligibility.

Eligibility Criteria

We included studies enrolling women with gynecological malignancies undergoing pelvic and/or inguinal lymphadenectomy, in which prophylactic lower-limb compression garments were prescribed—specifically medical-grade graduated compression stockings/garments—either as a stand-alone intervention or as a pre-specified component of a multimodal preventive program. Eligible studies had to report at least one lymphedema-related outcome, including lower-limb lymphedema incidence and/or changes in limb volume/circumference, and/or patient-reported outcomes. Randomized controlled trials constituted the core evidence base; prospective controlled studies and prospective cohort studies were retained as complementary primary evidence. Systematic/rapid reviews, scoping reviews, and clinical inquiries were considered secondary contextual sources for background and interpretation and were not pooled with primary studies to avoid double counting. We excluded studies not involving gynecological malignancy and/or not including pelvic/inguinal lymphadenectomy, studies lacking lymphedema-related outcomes, and studies focused exclusively on the treatment of established lymphedema. We also excluded studies addressing lymphedema at other non-relevant anatomical sites or non-oncologic populations unless gynecological oncology subgroups were clearly distinguishable.

Case reports, very small case series, commentary articles, and editorials without original data were excluded, as were studies evaluating surgical procedures or pharmacologic interventions without a compressive component.

Study Selection

Two reviewers independently screened titles and abstracts; potentially relevant articles were retrieved and assessed in full text. Any discrepancies were resolved by consensus; if consensus could not be reached, a third reviewer was designated to adjudicate. After the removal of 1819 duplicates, 4169 unique records were screened by title/abstract, and 536 full-text reports were assessed for eligibility.

Overall, 12 sources met the eligibility criteria: 8 primary studies (7 randomized controlled trials [RCTs] evaluating preventive interventions that included a compressive component[11-16,18] and 1 prospective cohort study on prophylactic complex physiotherapy, which also involved selective use of compression garments[19]) and 4 secondary/contextual sources (2 systematic/rapid reviews on conservative and compression-based interventions for cancer-related lymphedema,[8,17] 1 scoping review specifically addressing lower-limb lymphedema in patients with gynecological malignancies,[9] and 1 clinical inquiry on conservative strategies for lower-extremity lymphedema[10]). Secondary/contextual sources were screened for background and reference checking and were not treated as primary evidence for the main synthesis to avoid double counting. In relation to the predefined PICO question, the 'core' evidence base consisted of the 6 RCTs conducted in gynecological oncology populations.[11-16] The remaining randomized trial enrolling mixed tumor types[18] was retained as complementary primary (indirect/extrapolated) evidence and down-weighted accordingly.

Among the gynecological oncology randomized trials, multimodal preventive interventions in which compression garments were delivered as one component of a broader rehabilitation package[13,14] were retained within the core evidence base; however, because the independent effect of compression cannot be isolated, these trials were interpreted as evidence for multimodal prevention pathways and were not used to drive PICO-aligned conclusions about compression garments per se. The prospective cohort study[19] was included as complementary primary evidence, contributing context on feasibility and prevention pathways but not on the isolated effect of compression. Secondary/contextual sources (systematic/rapid reviews, scoping review, and clinical inquiry) were included only to contextualize the findings and support reference checking and were not included in the core evidence base. Here, "complementary primary evidence" refers to included primary studies outside the core evidence base (eg, mixed-population trials without separable gynecological subgroup data and non-randomized prospective cohorts), which were used to inform feasibility and prevention pathways but were not used to drive PICO-aligned conclusions about compression garments per se. The study selection process is summarized in the PRISMA 2020 flow diagram (Fig.).

Risk-of-Bias Assessment and Data Extraction

Risk of bias in the RCTs was assessed according to the domains of the Cochrane Risk of Bias tool, considering the Cochrane Risk of Bias 2 (RoB 2) tool domains (randomization process; deviations from intended interventions; missing outcome data; measurement of the outcome; and selection of the reported result). For the prospective cohort study, the potential for selection bias and confounding was evaluated using the ROBINS-I tool. Following RoB 2 guidance, overall judgment was "Low risk" if all domains were low risk, "Some concerns" if at least one domain raised some concerns and none were high risk, and "High risk" if one or more domains were high risk; for ROBINS-I, the overall judgment reflected the highest level of concern across domains. Study-level risk-of-bias judgments (and key domains of concern) are presented in Table 1.

Two reviewers independently extracted standardized-form data on: population characteristics (sample size, age, tumor type, lymphadenectomy extent, radiotherapy where applicable); compression intervention (garment type, class, duration, adherence); co-interventions (massage, exercise, education); lower-limb lymphedema definition; follow-up duration; incidence; limb volume changes; symptoms; quality of life; adverse events. For studies enrolling mixed oncology populations, gynecological-specific data were extracted whenever reported; when subgroup data were not separable, findings were treated as indirect (extrapolated) evidence and interpreted cautiously and not used to drive the core conclusions. Where reported, effect estimates (eg, Risk Ratio/Odds Ratio/Hazard Ratio), 95% confidence intervals (CIs), and *p*-values were extracted; when not reported but sufficient event data were available, unadjusted risk ratios with 95% CIs and two-sided Fisher's exact p-values were calculated from 2×2 tables using the denominators available at the reported follow-up (available-case analysis; intention-to-treat denominators were not reconstructable for some trials). The corresponding 2×2 tables are provided in Table 2.

Because studies differed substantially in design, populations, compression pressure/duration, lymphedema definitions, and follow-up, quantitative meta-analysis was inappropriate. We therefore performed a narrative synthesis by evidence type (systematic reviews vs RCTs), malignancy/procedure, compression characteristics, and main outcomes. Because no meta-analysis was performed, statistical heterogeneity metrics (eg, I^2 or τ^2) were not calculated, as these require pooled effect estimates.

The data are not currently available for independent analysis, as they are still being used for the preparation of a separate manuscript. They may be made available upon reasonable request once the related analyses have been completed and the manuscript has been published.

RESULTS

The included primary interventional studies comprised RCTs and one prospective cohort study.[11-16,18,19] PICO-aligned conclusions were based on the core gynecological oncology RCTs; within these, multimodal RCTs were interpreted as evidence for multimodal prevention pathways because compression effects cannot be isolated. The mixed-population RCT was treated as indirect evidence, and the cohort as complementary primary evidence. Across studies, lower-limb lymphedema was ascertained using study-specific criteria based on limb volume and/or circumference changes, sometimes complemented by symptoms or patient-reported

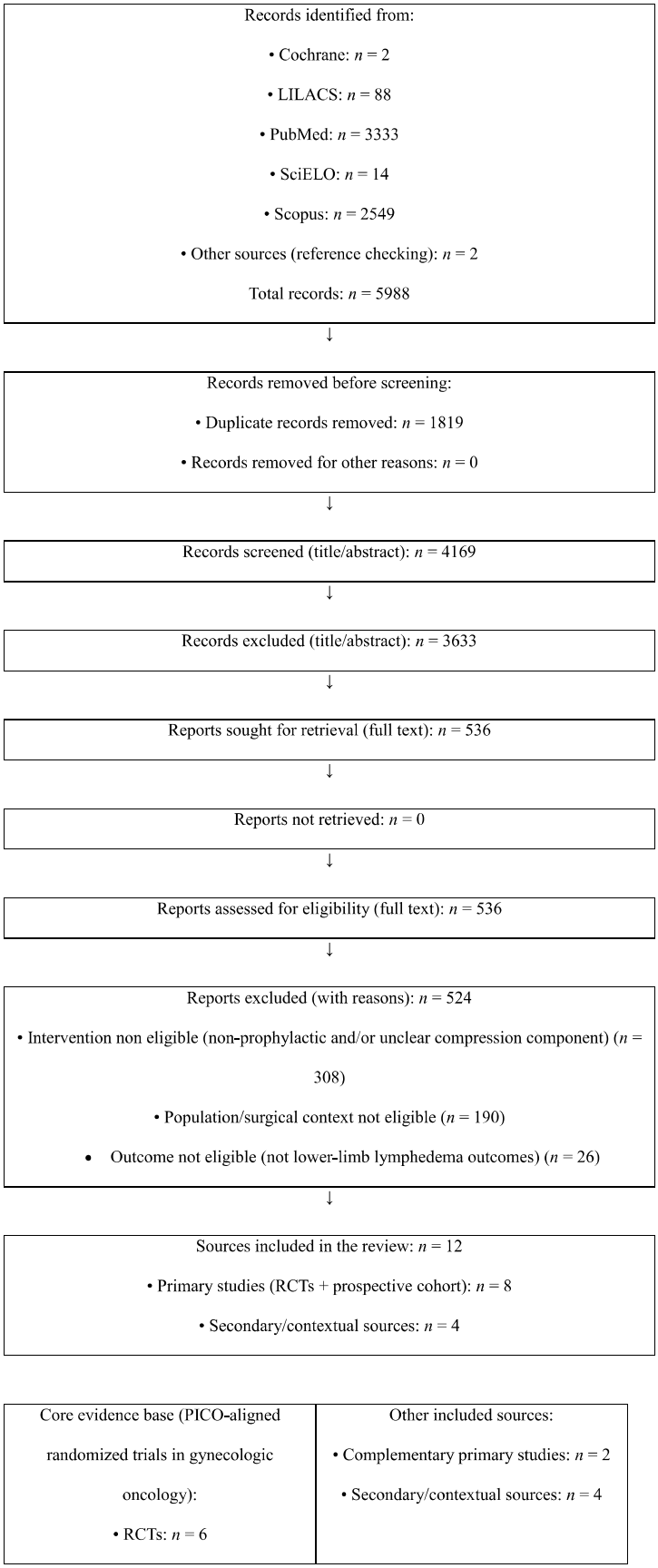

Figure PRISMA2020 flow diagram of study selection.

Table 1 Risk-of-Bias Assessment By Study Design and Tool

Study (ref.)	Design	Tool	Key domains/concerns identified	Overall judgment
Sawan and colleagues,[11] 2009	Pilot RCT	RoB 2	Small sample size; limited reporting of allocation concealment; participant blinding not feasible; limited adherence/outcome reporting	High risk
Stuiver and colleagues,[18] 2013	RCT	RoB 2	Participant blinding not feasible; allocation concealment and assessor blinding not consistently reported; adherence issues noted	Some concerns
Hnin and colleagues,[12] 2018	Pilot RCT	RoB 2	Small sample size; limited reporting of allocation concealment; participant blinding not feasible	High risk
Wang and colleagues,[13] 2020	RCT (modified CDT)	RoB 2	Participant blinding not feasible; compression embedded in multimodal package (attribution limitation); reporting of allocation concealment/assessor blinding variable	Some concerns
Wu and colleagues,[14] 2021	RCT (early CDT + exercise)	RoB 2	Participant blinding not feasible; multimodal package (attribution limitation); reporting of randomization/ concealment and assessor blinding variable	Some concerns
Zhang and colleagues,[15] 2024	RCT (3-arm)	RoB 2	Participant blinding not feasible; adherence reporting variable; outcome definitions/assessment schedules differ across arms	Some concerns
Kurpiewska-Pieniążek and colleagues,[16] 2025	RCT	RoB 2	Participant blinding not feasible; reporting of allocation concealment/assessor blinding may be limited; otherwise, objective outcome measurement	Some concerns
Daggez and colleagues,[19] 2023	Prospective cohort	ROBINS-I	Confounding and selection of participants; non-random allocation; potential measurement/reporting differences	Serious risk

Notes: RoB 2 overall judgments followed the RoB 2 algorithm ("Low risk," "Some concerns," or "High risk"). ROBINS-I overall judgment followed standard categories ("Low," "Moderate," "Serious," or "Critical" risk of bias).
Abbreviations: CDT, complex decongestive therapy; RCT, randomized controlled trial; ref., reference; RoB 2, Risk of Bias 2 tool; ROBINS-I, Risk Of Bias In Non-randomized Studies of Interventions.

measures. The RCTs and prospective study included in this review addressed different clinical settings: compression stockings in vulvar cancer with inguinal lymph node dissection,[11] after inguinal lymphadenectomy for urogenital tumors and melanoma,[18] after gynecological cancer treatment requiring lymphadenectomy,[12-16] and prophylactic complex physiotherapy in high-risk survivors.[19] Their main characteristics are summarized in Table 3.

Sawan assessed the feasibility/acceptability and preliminary efficacy of early post-operative graduated compression stockings versus usual care after inguinal lymphadenectomy for vulvar carcinoma. Outcomes were clinically defined as lower-limb lymphedema and leg-volume changes. The small randomized trial found good acceptability and less mean leg-volume increase with compression, suggesting edema containment, but no significant difference in lymphedema incidence.[11] Stuiver randomized patients undergoing inguinal lymph node dissection for urogenital tumors, gynecological malignancies, or melanoma to class II stockings for 6 months or no prophylactic compression. Outcomes were lymphedema incidence/onset, adherence, and adverse events. Because the trial enrolled a heterogeneous oncology population and gynecological-specific results were not consistently reported separately, its findings were treated as indirect (extrapolated) evidence for gynecological oncology and were weighted less heavily in the PICO-aligned synthesis. Stockings did not significantly reduce incidence or onset time; adherence/skin-tolerance issues suggested no clear benefit of moderate—high-pressure stockings alone without structured rehabilitation.[18]

Hnin's pilot RCT compared 6-week customized compression after gynecological cancer treatment with education/surveillance, assessing acceptability/adherence, lymphedema incidence, limb volume/circumference, and symptoms. No significant differences emerged, likely due to the small sample size, though symptoms and volume directionally favored compression.[12] Zhang randomized women after pelvic lymphadenectomy for cervical cancer to resistance exercise, graduated compression stockings, or usual care.[15] Incident lymphedema was measurement-based and reported as hazard ratios (HRs). Stockings showed intermediate incidence, with non-significant risk reduction versus usual care (HR 0.624, 95% CI 0.376 to 1.033). This comparison should be interpreted cautiously, as the study was not powered to detect differences between stockings and usual care, and the CI included the null, indicating imprecision. Compression directionally reduced risk, but less than structured exercise.[15] Finally, Kurpiewska-Pieniążek's RCT evaluated 12-month medium-pressure class II (23-32 mmHg) compression stockings in women treated for gynecological malignancies at high risk of lower-limb lymphedema.[16] This single-center trial randomized 64 patients to early prolonged class II stockings or no prophylactic compression, assessing incident lower-limb lymphedema by predefined limb measurements, plus symptoms, quality of life, adherence, and safety.[16]

Table 2 Compression Parameters and Effect Estimates

Study (ref.)	Type of garment	Compression class/pressure (reporting)	Prescribed duration	Mode of use	Main LLL outcome	LLL events/ total (I vs C)	Effect estimate (RR/HR; 95% CI; *p*)	Effect source/ analysis set	2 × 2 table (LLL yes/no)
Sawan and colleagues,[11] (p12) 2009	Prophylactic graduated compression stockings	Class I-II (NR/ unclear in original paper) Compression class/pressure not consistently specified in the original report (NR).	~6 mo (early post-operative period)	Daily use recommended for most of the day	Signal of a smaller volumetric increase compared with controls; no significant difference in clinically defined LLL incidence (feasibility study)	NR	NR	NR	NR
Stuiver and colleagues,[18] (p13) 2013	Full-length elastic compression stockings	Class II (≈23-32 mmHg)	6 mo	Daily use; variable adherence	No significant reduction in LLL incidence or time to onset compared with controls; some skin irritation and comfort issues	NR	NR	NR	NR
Hnin and colleagues,[12] (p14) 2018	Customized lower-limb compression garment	Individualized (custom-made); pressure NR Pressure/class not explicitly reported; individualized garment described as 'moderate' (NR).	6 wks	Routine use in the early post-operative period	LLL incidence reduced but not significantly; reported symptomatic benefit (less heaviness/ swelling) and good tolerability	NR	NR	NR	NR
Wang and colleagues,[13] (p15) 2020	Compression stockings as part of modified CDT	NR (reported as 'moderate' within CDT) Exact class/ pressure not reported; described qualitatively within the CDT package (NR).	12 wks	Daily use within the rehabilitation program	Component of a CDT package: significant reduction in LLL incidence (13.6% vs 34.5%) and severity compared with education alone	8/59 vs 20/ 58	RR (unadjusted) 0.39 (0.19 to 0.82), p = .01	Calculated from reported event counts; available-case denominators at follow-up (ITT not reconstructable).	I:8 yes/51 no; C:20 yes/38 no
Wu and colleagues,[14] (p16) 2021	Compression components integrated into early CDT	NR (not reported in original paper) Compression technical specifications (class/pressure) not reported in the original paper (NR).	Early post-operative period (≈40 d of active treatment)	Used in combination with lymph drainage and exercise	Significant reduction in LLL incidence (15.1% vs 32.1%) when combined with CDT and exercise; specific contribution of compression difficult to isolate	8/53 vs 18/ 56	RR (unadjusted) 0.47 (0.22 to 0.99), p = .04	Calculated from reported event counts; available-case denominators at follow-up (ITT not reconstructable).	I:8 yes/45 no; C:18 yes/38 no
Zhang and colleagues,[15] (p17) 2024	Compression stockings (dedicated trial arm)	Class II	Up to 24 mo	Daily use recommended; suboptimal adherence	Lower LLL risk compared with controls (28.1% vs 42.7%), but non-significant difference; PRET more effective than stockings alone; HR 0.624 (95% CI 0.376 to 1.033) for stockings vs control; trial not specifically powered for this comparison	25/89 vs 38/ 89	HR (reported) 0.624 (0.376 to 1.033), p = .07 Not specifically powered for stockings vs usual-care comparison; interpret cautiously (imprecise estimate).	As reported; three-arm RCT not powered for stockings vs usual care comparison.	I:25 yes/64 no; C:38 yes/ 51 no
Kurpiewska-Pieniążek and colleagues,[16] (p18) 2025	Full-length medium-pressure stockings	Class II, 23-32 mmHg	12 consecutive mo	Daily use (multiple hours per day), with education and adherence support	Marked and statistically significant reduction in LLL incidence (3.4% vs 38.7%); improved symptoms and quality of life; high adherence rate	1/29 vs 12/ 31	RR (unadjusted) 0.09 (0.01 to 0.64), p = .01	Calculated/ verified from reported event counts (2 × 2); denominators as reported at 12 mo.	I:1 yes/28 no; C:12 yes/19 no

Abbreviations: CDT, complex decongestive therapy; CI, confidence interval; HR, hazard ratio; I, intervention group; ITT, intention-to-treat; LLL, lower-limb lymphedema; NR, not reported; PRET, progressive resistance exercise training; RCT, randomized controlled trial; ref., reference; RR, risk ratio.
When RR and p-values were not reported, but event data were available, unadjusted RR with 95% CI and two-sided Fisher's exact p-values were calculated from crude 2 × 2 tables (last column). Denominators reflect available case counts when ITT denominators could not be reconstructed from the publication.

Table 3 Characteristics of Included Primary Studies

Study (year, ref.)	Gynecologic subset (n)	Design/ population	Compression intervention (prophylaxis)	Comparator	Follow-up	Main outcomes
Sawan and colleagues,[11] 2009	All gynecologic	Feasibility RCT; ~14 women with vulvar carcinoma undergoing inguino-femoral lymphadenectomy	Prophylactic graduated compression stockings (class I-II), daily use during the first post-operative months	Standard care without systematic use of compression garments	6-12 months	High feasibility and acceptability; smaller mean increase in leg volume in the compression group; no significant difference in clinically defined LLL incidence (underpowered study)
Stuiver and colleagues,[18] 2013	NR (mixed oncology population)	RCT; 80 patients undergoing inguinal lymph node dissection for melanoma or urogenital tumors (including a gynecologic cancer subgroup)	Class II elastic compression stockings (≈23-32 mmHg) for 6 months	No prophylactic compression (usual care)	12 months	No significant reduction in LLL incidence or time to onset; some issues with skin tolerance and adherence to stockings
Hnin and colleagues,[12] 2018	All gynecologic	Pilot RCT; ~56 women treated for gynecologic cancers with pelvic/inguinal lymphadenectomy	Custom-made lower-limb compression garment, routine use for 6 weeks	No prophylactic garment; same education and surveillance	6-12 months	Numerically lower LLL incidence in the compression group, although not statistically significant; subjectively reported reductions in heaviness and swelling; good acceptability
Wang and colleagues,[13] 2020	All gynecologic	RCT; 117 women undergoing radical hysterectomy plus pelvic lymphadenectomy for cervical cancer	Modified CDT including manual lymph drainage, compression stockings, exercise, and education for 12 weeks	Education/ standard care without structured CDT	12 months	Significantly reduced LLL incidence (13.6% vs 34.5%); lower excess limb volume and later onset of LLL in the CDT group
Wu and colleagues,[14] 2021	All gynecologic	RCT; 109 women undergoing surgery for gynecologic cancer	Early CDT plus rehabilitative exercise and education (including a compression component)	Standard treatment without a structured rehabilitation program	12 months	LLL incidence 15.1% vs 32.1%; improved quality-of-life scores (EORTC QLQ-C30) and reduced fatigue (BFI) in the intervention group
Zhang and colleagues,[15] 2024	All gynecologic	Three-arm RCT; 267 women undergoing pelvic lymphadenectomy for cervical cancer	PRET (progressive resistance exercise training) vs compression stockings vs control (standard education)	Control arm (education only)	24 months	LLL incidence: 9.0% (PRET), 28.1% (stockings), 42.7% (control); PRET significantly superior; stockings with a favorable but non-significant trend (HR 0.624, 95% CI 0.376 to 1.033); trial not specifically powered for the stockings vs control comparison.

(*continued on next page*)

Table 3 (*continued*)

Study (year, ref.)	Gynecologic subset (n)	Design/ population	Compression intervention (prophylaxis)	Comparator	Follow-up	Main outcomes
Daggez and colleagues,[19] 2023	All gynecologic	Prospective cohort; ~135 gynecologic cancer survivors at high risk, free of LLL at baseline	Prophylactic complex physiotherapy (exercise, education, self-care, and selective use of compression according to risk)	Standard follow-up only	~12-14 months	Lower LLL prevalence and more favorable scores on the Gynecologic Cancer Lymphedema Questionnaire (GCLQ) in the physiotherapy group
Kurpiewska-Pieniążek and colleagues,[16] 2025	All gynecologic	RCT; 64 women treated for gynecologic malignancies at high risk of LLL (extensive lymphadenectomy and/or elevated BMI)	Medium-pressure stockings (class II, 23-32 mmHg), daily use for 12 months, plus education and promotion of physical activity	No prophylactic compression, same education/ activity recommendations	12 months	Significantly reduced LLL incidence (3.4% vs 38.7%); fewer symptoms, better function and quality of life; good adherence and tolerability

Prospective studies on prophylactic compression (RCTs and cohort) in women undergoing treatment for gynecologic malignancies or pelvic/inguinal lymph node dissection
"Gynecologic subset (*n*)" indicates whether gynecologic-only participants were included or whether a mixed oncology population was enrolled.
Abbreviations: BFI, Brief Fatigue Inventory; BMI, body mass index; CDT, complex decongestive therapy; CI, confidence interval; EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; GCLQ, Gynecologic Cancer Lymphedema Questionnaire; HR, hazard ratio; LLL, lower-limb lymphedema; NR, not reported separately in the original paper; PRET, progressive resistance exercise training; RCT, randomized controlled trial; ref., reference.

Results should be interpreted cautiously and confirmed in larger multicenter trials. Lower-limb lymphedema incidence was 3.4% with compression versus 38.7% without, a clinically and statistically significant difference; risk ratio and Fisher's exact *p*-value were calculated from reported event counts (see Table 2 for the 2 × 2 table, unadjusted risk ratio 0.09, 95% CI 0.01 to 0.64; Fisher's exact $p = .001$). Treated patients also reported fewer symptoms, better quality of life, and good adherence and tolerability. Overall, standalone prophylactic compression showed heterogeneous results: older, smaller trials found limited or non-significant effects on lower-limb lymphedema incidence,[11,12,18] whereas the most recent RCT showed a marked preventive effect with 12-month class II stockings in carefully selected patients.[16]

Wang and Wu RCTs tested early/modified Complex Decongestive Therapy—manual drainage, exercise, education, and compression—versus standard care after pelvic lymphadenectomy for cervical cancer. Outcomes included measurement-defined lymphedema, symptoms, and quality of life; because compression was only one component, effects cannot be attributed to compression alone.[13,14] Thus, these trials support multimodal prevention. In Wang's trial, modified therapy reduced incidence and delayed onset versus education alone (13.6% vs 34.5%), with lower severity and symptoms[13]; risk ratio and Fisher's exact p-value calculated from reported event counts (see Table 2 for the 2 × 2 table, unadjusted risk ratio 0.39; 95% CI 0.19 to 0.82; Fisher's exact $p = .010$).

Wu's trial confirmed similar findings in a comparable population: lower-limb lymphedema incidence was 15.1% with early complex decongestive therapy plus exercise versus 32.1% in controls, with significant improvements in quality of life and fatigue; risk ratio and Fisher's exact p-value, calculated from reported event counts (Table 2), were 0.47 (95% CI 0.22 to 0.99) and 0.04, respectively. Lymphedema was assessed using pre-specified limb-measurement criteria, alongside patient-reported fatigue and quality-of-life instruments.[14] Daggez's prospective cohort study of prophylactic complex physiotherapy in gynecological cancer survivors at high risk of lower-limb lymphedema found lower lymphedema rates and better Gynecological Cancer Lymphedema Questionnaire scores with the program than with standard follow-up alone. The study assessed a structured prophylactic physiotherapy pathway, including selective compression garment use, using both objective outcomes and a disease-specific patient-reported measure to capture symptom impact and functional burden.[19] Because compression was selective within a broader physiotherapy program and not the sole exposure, the study provides complementary evidence on preventive pathways and feasibility rather than direct evidence of compression effectiveness. Overall, although these studies cannot isolate the effect of compression garments from other intervention components, they support structured multimodal prevention pathways, such as complex decongestive therapy or physiotherapy programs, in which compression may contribute, but the independent effect of compression remains unclear.

Compression parameters varied markedly across studies by garment type (stockings, pantyhose, custom-made garments), class (I to II), duration (6 weeks to 12 months), and prescription intensity (daily vs partial use). The strongest preventive results, particularly in Kurpiewska-Pieniążek's study, came from continuous 12-month class II stockings in carefully selected high-risk patients.[16] When compression was shorter, lower-pressure, or

insufficiently supported by education and exercise, effects on lower-limb lymphedema incidence were generally smaller or non-significant.[11,12,15,18] Main compression parameters and related lower-limb lymphedema outcomes are summarized in Table 2.

A domain-level risk-of-bias summary is shown in Table 1. Under RoB 2, the main concerns in RCTs were (i) the randomization process (often unclear allocation concealment), (ii) deviations from intended interventions (participant blinding infeasible for compression), and (iii) selection of the reported result (absence of prospectively available protocols/analysis plans in some trials). Missing outcome data were generally limited, though attrition and adherence reporting varied. Outcome assessment was mainly based on objective limb volume/circumference measures, likely reducing detection bias, but assessor blinding was inconsistently reported. For the prospective cohort study, ROBINS-I identified serious concerns about confounding and participant selection. Overall, risk of bias was judged as "high risk" for pilot RCTs, "some concerns" for the remaining RCTs, and "serious" for the prospective cohort study (ROBINS-I).

DISCUSSION

Summary of Main Results

This systematic review suggests that prophylactic compression may reduce secondary lower-limb lymphedema after pelvic and/or inguinal lymphadenectomy for gynecological malignancies, but evidence remains inconclusive. Older small studies mainly showed feasibility and possible limb-volume or symptom benefits without robust incidence reduction.[11,12,18] Trials of prophylactic Complex Decongestive Therapy showed that early structured rehabilitation reduced lymphedema risk,[13,14] but these multimodal interventions do not isolate the effect of compression. Zhang's trial found progressive resistance exercise most effective, with stockings showing intermediate but underpowered and imprecise benefit versus usual care.[15] The strongest direct evidence comes from Kurpiewska-Pieniążek's single-center randomized trial, in which 12-month class II stockings plus education/activity reduced lower-limb lymphedema incidence, but the sample was small ($n = 64$), and confirmation is needed.[16]

Results in the Context of Published Literature

Secondary lower-limb lymphedema most often follows gynecological malignancies, with the highest risk in vulvar cancer, followed by urologic and cutaneous tumors.[20-22] Prevention for high-risk gynecologic oncology patients is increasingly used.[21,23-28] Conservative reviews confirm Complex Decongestive Therapy for established disease but provide little direct evidence for prevention after pelvic/inguinal lymphadenectomy.[8,17] Tümkaya's scoping review mapped gynecological prevention and rehabilitation strategies, including compression within multimodal pathways, outcome definitions, and trial gaps.[9] Zoberi's clinical inquiry emphasized early recognition and management but provided no new prevention estimates.[10] Together with Daggez's complex physiotherapy cohort,[19] these data suggest that compression may be clinically relevant within a structured preventive program for high-risk patients. However, much evidence remains indirect because gynecological subgroup data were often inseparable, extrapolated from non-gynecological settings, or derived from multimodal programs in which compression was only one component.

Strengths and Weaknesses

Strengths of the included trials include objective limb-volume measurement, symptom and quality-of-life assessment, safety monitoring, and, in some studies, follow-up up to 24 months.[12] Strengths of this review include a predefined PICO-based approach, comprehensive database searching, independent dual study selection, and an evidence hierarchy in which PICO-aligned conclusions relied primarily on randomized trials, while cohort and secondary contextual sources informed only background and interpretation.

Limitations include the small number of randomized trials, pilot designs and small samples, population heterogeneity, variable compression protocols, heterogeneous lymphedema definitions and follow-up, limited blinding, inconsistent adherence reporting, and possible measurement bias.[11,12,18] Several studies embedded compression in multimodal programs, preventing attribution of benefit to compression alone. Trial quality was variable: small pilot studies had high imprecision risk,[11,12,18] whereas other trials had better randomization but limited blinding and non-uniform outcome definitions.[15,18] Prophylactic Complex Decongestive Therapy trials were stronger but could not isolate compression effects.[13,14] Consistent with RoB 2 (Table 1), several studies were high risk or had some concerns, particularly for deviations from intended interventions, adherence reporting, and outcome assessment, as assessor blinding was inconsistently reported. Review limitations include possible missed grey literature studies, lack of prospective protocol registration (eg, PROSPERO), and absence of formal Grading of Recommendations Assessment, Development and Evaluation assessment (GRADE), which limits interpretation of recommendation strength. The focus on gynecological malignancies limits generalizability but preserves relevance to the research question.

Implications for Practice and Future Research

Routine prophylactic stocking use in all patients is probably unjustified, as several trials in heterogeneous populations found no clear benefit.[12,15,18] Benefit appears greater with well-fitted, medium-pressure, long-term stockings, particularly class II (23-32 mmHg) for at least 12 months, than with low-pressure or short-duration regimens[13,14,16,19]; however, the strongest estimate comes mainly from one small single-center trial.[16] Stockings alone appeared less effective than structured exercise-based multimodal programs, so compression should preferably be integrated into prevention programs, including education and active surveillance.[15] Prescribing should be shared with the patient and should address benefits, evidence limits, costs, comfort, donning difficulties, and alternatives such as supervised exercise or physiotherapy. Pending stronger evidence, prophylactic compression may be selectively offered to high-risk patients, including those with high body mass index, extensive lymphadenectomy, and concomitant or prior radiotherapy,[3,4,21,29] within multimodal prevention and surveillance programs.

Large multicenter randomized trials are needed, with standardized lymphedema definitions, at least 2 years' follow-up, and direct comparisons of compression classes and garment types. Future studies should compare standalone compression with compression integrated into Complex Decongestive Therapy or exercise programs and evaluate biomarker- or lymphatic imaging—based screening and early-intervention strategies. Patient-reported outcomes, cost-effectiveness analyses, and implementation studies are also needed.

CONCLUSIONS

Our findings suggest that prophylactic compression is biologically plausible and feasible in high-risk patients when adherence is supported within a rehabilitative framework. Early prolonged class II stockings were associated with lower lower-limb lymphedema incidence in some studies, but evidence remains limited, heterogeneous, and driven mainly by small trials, including one single-center RCT needing larger multicenter confirmation. Prophylactic stockings should therefore be considered a possible component of structured prevention pathways for selected high-risk women, not an established standard of care. This review provides a clinically oriented synthesis to support shared decision-making and guide future confirmatory trials.

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