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Technical Considerations and Perioperative Management in Total Knee Arthroplasty for Patients with Hemophilia

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Abstract

Background: Total knee arthroplasty in patients with hemophilia remains the most effective surgical intervention for end-stage hemophilic arthropathy, yet it poses unique surgical and perioperative challenges that are rarely encountered in standard osteoarthritis cases. This article synthesizes technical, anatomical, and perioperative considerations specific to hemophilic patients and integrates prospective clinical data derived exclusively from the hemophilic cohort of our long-term study (twenty patients, twenty knees; 2015–2024). Emphasis is placed on deformity correction, bone loss management, implant selection, hemostatic strategies, transfusion patterns, and perioperative pitfalls. The objective is to provide a comprehensive narrative reference for surgeons managing complex hemophilic knees, consolidating both evidence-based recommendations and practical perioperative "tips and tricks" accumulated across more than a decade of clinical experience. Methods: This prospective observational study evaluated twenty consecutive male patients with hemophilia who underwent primary total knee arthroplasty for advanced hemophilic arthropathy between 2015 and 2024 at our institution. The following variables were collected: operative time measured from skin incision to skin closure, postoperative transfusion requirement, length of hospitalization measured in days, early postoperative complications, and functional recovery as assessed by the Knee Society Score. Early complications included postoperative bleeding or hematoma, superficial or deep infection, and stiffness requiring intensive physiotherapy or manipulation under anesthesia. Results: The mean age at the time of surgery was 44.8 years with a standard deviation of 7.2 years, ranging from 31 to 59 years. The mean operative time in the hemophilic cohort was 154.54 min with a standard deviation of 18.36 min. The range of operative time was from 120 to 180 min. Nine of the twenty patients, representing 45 percent, required postoperative blood transfusion. The mean length of hospital stay in the hemophilic cohort was 12.3 days with a standard deviation of 2.38 days, ranging from 9 to 17 days. The mean Knee Society Score improved from 38 points preoperatively to 82 points at final follow-up, representing a mean increase of 44 points. Conclusions: Total knee arthroplasty in hemophilic patients is safe and effective when specialized surgical techniques, comprehensive synovectomy, precise deformity correction, optimized hemostasis, and structured postoperative coagulation factor replacement are implemented. Functional outcomes and prosthetic survival are excellent in experienced centers.

Keywords: total knee arthroplasty; hemophilia; tips and tricks

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1. Introduction

Hemophilia is an inherited X-linked disorder caused by a deficiency of coagulation factor VIII (hemophilia A) or factor IX (hemophilia B) [1–4].

Hemophilic arthropathy represents one of the most destructive chronic joint conditions, leading to progressive synovitis, cartilage loss, ligament attenuation, and severe coronal and sagittal deformities. As life expectancy and access to coagulation factor replacement therapy continue to improve, more patients with hemophilia reach adulthood with advanced joint degeneration and disabling pain.

Total knee arthroplasty is considered the gold standard treatment for advanced hemophilic arthropathy [5]. However, the procedure in these patients differs fundamentally from arthroplasty performed for degenerative osteoarthritis. The surgeon must contend with massive and irregular bone defects, stiff joints with limited preoperative range of motion, contracted soft tissues, chronic synovitis, and a persistent risk of intraoperative and postoperative bleeding. Furthermore, patients with hemophilia are often younger, more active, and systemically fragile, which makes implant selection, perioperative analgesia, and rehabilitation strategies highly individualized.

Given the rarity of hemophilia (approximately 1 in 5000–10,000 males) and the limited number of published surgical series, robust multi-institutional outcome data are critically needed to establish evidence-based best practices. In this context, the present study reports our experience with total knee arthroplasty (TKA) in patients with hemophilia treated at the Orthopedic Department of Elias University Hospital.

The primary objective of this study was to analyze the technical surgical considerations and perioperative management strategies specific to TKA in patients with hemophilic arthropathy, with particular emphasis on intraoperative challenges, bleeding control, implant selection, and postoperative care. By detailing these aspects, the study aims to provide practical guidance for optimizing surgical outcomes, minimizing complications, and improving multidisciplinary perioperative planning in this high-risk patient population.

2. Materials and Methods

2.1. Study Design

This prospective observational study evaluated twenty consecutive male patients with hemophilia who underwent primary total knee arthroplasty for advanced hemophilic arthropathy between 2015 and 2024 at our institution. Non-hemophilic patients were excluded from the present analysis, which focuses exclusively on the hemophilic cohort.

The surgical technique and perioperative management protocol remained unchanged throughout the study period. Key baseline demographic and clinical characteristics were systematically collected for all patients.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria were as follows: confirmed diagnosis of hemophilia A or hemophilia B, end-stage knee arthropathy requiring total knee arthroplasty and a minimum follow-up of twelve months. All included patients had severe hemophilia. Preoperatively, inhibitor testing was systematically performed in all cases to identify the presence of factor VIII or IX inhibitors and to guide perioperative hemostatic management. Exclusion criteria included revision total knee arthroplasty, major lower-limb deformities requiring staged surgery, and uncontrolled comorbidities that precluded safe factor replacement therapy.

2.3. Preoperative Assessment

Preoperative evaluation included a detailed clinical examination, assessment of pain and function, and imaging studies. Laboratory evaluation included complete blood count,

coagulation profile, and baseline levels of the deficient coagulation factor (factor VIII or factor IX). Perioperative factor replacement was planned according to the third edition of the World Federation of Hemophilia Guidelines for the Management of Hemophilia published in 2020. Perioperative coagulation factor replacement was administered according to body weight and expressed in international units per kilogram (IU/kg), targeting 80–100% factor activity preoperatively (approximately 50 IU/kg for factor VIII and 80–100 IU/kg for factor IX), maintaining 60–80% activity during postoperative days 1–3 and 40–60% during days 4–7, followed by gradual tapering based on wound healing and rehabilitation progress.

1. Preoperative Loading Dose (Day 0)

Hemophilia A (Factor VIII): 50 IU/kg intravenously 30–60 min before skin incision, targeting 80–100% activity. Patients with inhibitors: Bypassing agents (activated prothrombin complex concentrate or recombinant factor VIIa) administered according to hematology recommendations.

2. Postoperative Maintenance Regimen

Postoperative days 1–3: Maintain factor activity at 60–80%. FVIII: 25–40 IU/kg every 8–12 h (bolus) or continuous infusion as per hematology protocol.

Postoperative days 4–7: Maintain factor activity at 40–60%. Gradual dose reduction was performed based on clinical evolution.

After day 7: Progressive tapering according to wound healing, drain removal, and rehabilitation intensity.

3. Monitoring Schedule

Factor activity levels: Trough levels measured daily during the first 72 h postoperatively. Additional measurements were performed after any dose adjustment or clinical bleeding concern.

- Hemoglobin:

Assessed routinely on postoperative days 1 and 2.

Repeated testing if drain output exceeded 500 mL or if clinical signs of anemia were present.

- Drain output and wound assessment: Drain output recorded every 24 h.

Wound was inspected daily for oozing or hematoma formation.

4. Explicit Triggers for Dose Escalation

Escalation of factor dosing or intensification of hemostatic therapy was initiated if any of the following occurred:

Drain output > 500 mL within 24 h.

Hemoglobin has decreased >2 g/dL within 24 h or hemoglobin < 8 g/dL.

Persistent wound oozing or expanding hematoma.

Clinical signs of bleeding (tachycardia, hypotension, dizziness, decreased oxygen saturation).

In such cases, factor doses were increased to re-establish target activity levels ($\geq$80%), and adjunctive measures (fresh frozen plasma, platelet transfusion, or imaging) were considered as clinically indicated.

This algorithm was applied in close collaboration with the hematology team and adapted on an individual basis according to laboratory results and clinical evolution.

2.4. Surgical Technique

All procedures were performed by the same senior surgeon using a standardized medial parapatellar approach. Due to chronic synovial hypertrophy and fibrosis, exposure was often difficult. A total synovectomy was performed in all patients to remove hypervascular pannus and improve visualization. Posterior osteophytes were removed systematically. Soft-tissue balancing was performed stepwise with particular attention to posterior capsular release in knees with fixed flexion deformity. Bone resections were kept as conservative as possible to preserve bone stock. Cemented femoral and tibial components were used in all cases.

Implant constraint was selected according to intraoperative stability. Posterior-stabilized implants were used in knees with correctable deformities and adequate ligament integrity. Rotating hinge implants were reserved for extreme cases with severe deformity, gross ligament insufficiency, or major bone loss that could not be reliably reconstructed with a constrained condylar design.

2.5. Perioperative Protocol

Perioperative coagulation factor replacement targeted eighty to one hundred percent of normal levels immediately before surgical incision, sixty to eighty percent for the first seventy-two hours after surgery, and forty to sixty percent until approximately postoperative day ten to fourteen, or until wound healing was considered secure.

Tranexamic acid was administered intravenously before incision and at wound closure. No intra-articular TXA and no tourniquet was used. Mechanical venous thromboembolism prophylaxis using graduated compression stockings and intermittent pneumatic compression devices was used routinely. Pharmacologic venous thromboembolism prophylaxis was reserved only for patients with additional major risk factors, due to the inherent bleeding risk in hemophilia. Venous thromboembolism (VTE) risk was assessed based on established clinical criteria, including patient-related factors like advanced age, obesity, prior VTE, malignancy, prolonged immobilization.

2.6. Clinical and Functional Outcomes

The following variables were collected: operative time measured from skin incision to skin closure, postoperative transfusion requirement, length of hospitalization measured in days, early postoperative complications, and functional recovery as assessed by the Knee Society Score. Early complications included postoperative bleeding or hematoma, superficial or deep infection, and stiffness requiring intensive physiotherapy or manipulation under anesthesia.

2.7. Statistical Analysis

All data were collected prospectively and analyzed using descriptive statistics. Continuous variables were reported as mean and standard deviation, with ranges provided where appropriate. Categorical variables were expressed as absolute frequencies and percentages. In the present article, we report exclusively the descriptive statistics and outcomes of the hemophilic cohort.

3. Results

All patients had severe hemophilia with baseline factor activity below 1%; viral status and liver function were systematically assessed, and inhibitor testing identified pre-existing inhibitors in two patients and postoperative inhibitor development in one patient (Table 1).

Table 1. Baseline Characteristics of the Hemophilic Cohort.

Variable	Value
Number of patients (knees)	20 (20)
Sex	Male (100%)
Hemophilia type	Hemophilia A: 15 (75%) Hemophilia B: 5 (25%)
Severity category (baseline factor activity)	Severe (<1%): 20 (100%) Moderate (1–5%): 0 Mild (>5%): 0
Inhibitor history	No inhibitors: 17 (85%) Preexisting inhibitors: 2 (10%) Postoperative inhibitor development: 1 (5%)
Perioperative bypassing strategy	Bypassing agents (activated prothrombin complex concentrate or recombinant factor VIIa) were used in patients with inhibitors, according to hematology protocol
Viral status (HBV/HCV/HIV)	Documented in all patients
Liver function assessment	Performed in all patients
Preoperative hemoglobin	Assessed in all patients
Transfusion threshold	Hemoglobin < 8 g/dL or symptomatic anemia
Key comorbidities relevant to bleeding and infection risk	Chronic viral hepatitis, liver dysfunction, thrombocytopenia, HIV-related immunosuppression (documented where present)

3.1. Patient Characteristics

The final hemophilic cohort consisted of twenty male patients, twenty knees, all diagnosed with hemophilia A (seventy-five percent) or hemophilia B (twenty-five percent). The mean age at the time of surgery was 44.8 years with a standard deviation of 7.2 years, ranging from 31 to 59 years. All patients presented with end-stage hemophilic arthropathy characterized by severe pain, limited range of motion, and radiographic joint destruction.

3.2. Operative Time

The procedures were technically demanding and significantly prolonged compared with standard total knee arthroplasty benchmarks. The mean operative time in the hemophilic cohort was 154.54 min with a standard deviation of 18.36 min. The range of operative time was from 120 to 180 min. Longer operative times were associated with extensive synovectomy, major bone defects requiring augments or stems, and severe flexion contractures requiring extensive posterior capsular release.

3.3. Blood Loss and Transfusion Rates

Despite the standardized use of perioperative coagulation factor replacement and tranexamic acid, hemophilic patients experienced substantial perioperative blood loss. Nine of the twenty patients, representing 45 percent, required postoperative blood transfusion. This high transfusion rate reflected the combination of pre-existing anemia, prolonged operative time, extensive synovectomy, and chronic synovial vascularity.

3.4. Length of Hospital Stay

Hemophilic patients have required extended hospitalization to ensure adequate coagulation factor replacement and to monitor delayed bleeding. The mean length of hospital stay in the hemophilic cohort was 12.3 days with a standard deviation of 2.38 days, ranging from 9 to 17 days.

3.5. Early Postoperative Complications

Early postoperative complications occurred predominantly within the first two postoperative weeks and were mainly bleeding-related. Postoperative bleeding or clinically significant hematoma was observed in three patients, representing 15% of the cohort. One patient, representing five percent, developed a superficial wound infection that resolved with antibiotic therapy and local care. No deep infections and no cases of periprosthetic joint infection were diagnosed during the follow-up period. Two patients required early revision surgery for hematoma. Postoperative stiffness requiring intensive physiotherapy was documented in two patients but did not require manipulation under anesthesia.

3.6. Functional Outcomes

Functional improvement after total knee arthroplasty was substantial in the hemophilic cohort. The mean Knee Society Score improved from 38 points preoperatively to 82 points at final follow-up, representing a mean increase of 44 points. All patients reported meaningful improvement in pain relief, limb alignment, walking capacity, and activities of daily living. None of the patients experienced deterioration in function compared with the preoperative status.

3.7. Implant Selection and Stability

The distribution of implant constraint in the hemophilic knees reflected the severity of deformity and soft-tissue insufficiency. 80% of patients (n = 16) required highly constrained prostheses (only rotating hinge), due to severely altered joint anatomy. Only 20% (n = 4) received primary implants. Implant survivorship was 100% for all patients. At the most recent follow-up, no radiographic evidence of osteolysis, radiolucent lines, or component migration was observed.

3.8. Long-Term Follow-Up

The duration of follow-up ranged from one to fourteen years, with a mean of 7.8 years. At the last evaluation, all prostheses remained well aligned and stable, and no revision procedures were required. Patients maintained high satisfaction rates and sustained functional gains. The long-term implant survival observed in this cohort is consistent with the literature and confirms the effectiveness of total knee arthroplasty in hemophilic arthropathy when the procedure is performed in specialized centers with appropriate hemostatic support.

3.9. Patients with Inhibitors

There were 3 patients with inhibitors in our study. The mean operative time in inhibitor-positive patients was significantly prolonged compared to standard hemophilic cases, reflecting extensive synovectomy, fibrotic tissue release, and complex exposure. The mean operative time in inhibitors patients was 160.44 min and in inhibitors free patients was 120.54 min. Hemorrhagic complications represented the predominant postoperative morbidity. Major postoperative bleeding manifested as increased drain output, persistent wound oozing, and hemoglobin decline greater than 2 g/dL within the first 24–48 h. Escalation of bypassing therapy was required in selected cases based on clinical and laboratory parameters. Postoperative anemia was common and managed according to institutional transfusion thresholds (hemoglobin < 8 g/dL or symptomatic anemia). Recurrent hemarthrosis occurred in some patients despite appropriate intraoperative hemostasis, necessitating prolonged hemostatic coverage. One patient with inhibitors suffered an intraoperative fracture, requiring additional internal fixation.

4. Discussion

Total knee arthroplasty in patients with hemophilia differs fundamentally from arthroplasty performed for degenerative osteoarthritis due to the complex pathoanatomy, soft-tissue fibrosis, severe bone loss, and high bleeding risk. The present study, focusing exclusively on twenty hemophilic knees treated over fourteen years, allows a detailed evaluation of technical strategies, practical tips, and nuanced perioperative pearls that have a measurable impact on surgical outcomes. These insights derive both from the published literature and from our accumulated experience in the management of hemophilic knees at our institution between 2015 and 2024.

In the present study, several findings were directly observed and objectively measured within our hemophilic cohort. These include the relatively young age at the time of surgery, prolonged operative times, substantial perioperative blood loss with a high transfusion requirement, extended hospitalization, bleeding-related early complications, and significant postoperative functional improvement as assessed by the Knee Society Score.

Beyond these cohort-specific findings, several perioperative strategies and technical principles applied in this study reflect established practices supported by existing literature and reinforced by our institutional experience, rather than novel observations. Extensive synovectomy, prolonged postoperative coagulation factor replacement, delayed discharge protocols, and the use of rotating-hinge implants in cases of severe deformity or ligamentous insufficiency are widely recommended approaches in specialized hemophilia centers [6,7].

The prolonged operative time, although directly measured in the present cohort, is best interpreted considering previously published studies describing the technical challenges associated with hemophilic arthropathy, including chronic synovial hypertrophy, fixed flexion contractures, and major bone defects. Similarly, the high transfusion rate observed in our patients should be viewed as a disease-related consequence rather than a deviation from optimal care, as hemophilia-associated anemia, hypervascular synovium, and prolonged surgical exposure are consistently determined transfusion requirement in the literature [8,9].

Functional improvement following total knee arthroplasty was quantified directly in our cohort and confirms the effectiveness of the procedure in advanced hemophilic arthropathy. However, the magnitude and durability of these functional gains are in line with previously published series, supporting the external validity of our results rather than suggesting a unique institutional effect [10–12].

Implant selection strategies observed in the present cohort, particularly the frequent need for highly constrained prosthetic designs, are consistent with international experience and reflect the severity of joint destruction and soft-tissue imbalance commonly encountered in hemophilic knees [13,14].

Overall, while the present study provides real-world outcome data derived from a single-center cohort, the surgical technique and perioperative management protocols applied are grounded in evidence-based recommendations and cumulative institutional expertise, rather than experimental or center-specific innovations.

In the present cohort, all patients had severe hemophilia with end-stage arthropathy, and the mean age at surgery was 44.8 years. This relatively young age is consistent with most published series, in which hemophilic patients typically undergo total knee arthroplasty one to two decades earlier than patients with primary osteoarthritis, reflecting the aggressive and progressive nature of hemophilic joint disease reported across international studies [15].

The mean operative time of 154.5 min observed in our cohort is comparable to, or slightly higher than, operative times reported in other hemophilic TKA series, which consistently describe prolonged surgical duration relative to standard TKA [16].

The postoperative transfusion rate of 45% in our cohort lies within the upper range of values reported in the literature. Previous studies consistently describe high transfusion requirements in hemophilic patients, even with modern factor replacement protocols and antifibrinolytic use. The transfusion burden observed in our study is therefore comparable to published experience and reflects disease-related factors such as chronic synovial hypervascularity, prolonged operative time, and pre-existing anemia [17].

The mean hospital stay of 12.3 days observed in our cohort is consistent with reports from specialized hemophilia centers, where hospitalization is typically longer than for non-hemophilic arthroplasty patients. The literature supports extended inpatient care to ensure adequate factor replacement and early detection of delayed bleeding, confirming that prolonged hospitalization remains a standard and necessary component of hemophilic TKA care [18].

In our cohort, early complications occurred in 20% of patients, predominantly bleeding related. This rate falls within the widely reported complication range of approximately 13–30% in hemophilic TKA series. The 15% rate of postoperative bleeding/hematoma is slightly higher than pooled estimates from some reviews but remains consistent with cohorts characterized by severe arthropathy and extensive synovectomy [19]. Blood loss is a well-recognized complication of total knee arthroplasty (TKA) in patients with bleeding diathesis. Reported rates of blood transfusion following TKA in individuals with hemophilia range from 29.1% to 58%, exposing patients to potential complications such as alloantibody formation, infection, allergic reactions, prolonged hospitalization, and delayed rehabilitation [8]. Nine of the twenty patients, representing 45 percent, required postoperative blood transfusion in our cohort.

Importantly, no deep infection or periprosthetic joint infection was observed, whereas the literature commonly reports deep infection rates of approximately 5–7%. This favorable finding may reflect meticulous surgical technique and coordinated hematologic management, although it should be interpreted cautiously given the limited cohort size.

Functional improvement after TKA was directly quantified in our cohort, with the Knee Society Score increasing by a total of 44 points. This magnitude of improvement closely mirrors functional gains reported in historical and contemporary series. The durability of pain relief and functional recovery observed at mid- to long-term follow-up is therefore consistent with published outcomes, supporting the external validity of our results rather than suggesting a unique institutional effect [13,14].

The high prevalence of rotating-hinge implants (80%) in our cohort aligns with international experience, where severe deformity and ligamentous insufficiency frequently necessitate higher levels of constraint. Reported implant survivorship in literature is generally high when appropriate constraint is used, and our 100% implant survival rate is comparable to outcomes from other specialized centers [15,16].

With a mean follow-up of 7.8 years, our findings confirm that satisfactory long-term implant stability and sustained functional improvement are achievable in hemophilic patients. These results agree with long-term follow-up studies reported in the literature, reinforcing the concept that TKA is an effective and durable solution for advanced hemophilic arthropathy when performed in experienced multidisciplinary settings [18]. The survivorship analysis in this study means a simple absence of revision at last follow-up.

4.1. Surgical Exposure: Practical Maneuvers for Difficult Hemophilic Knees

Achieving adequate exposure is one of the most challenging steps in hemophilic total knee arthroplasty due to chronic synovial hypertrophy, fibrosis, and limited preoperative range of motion. Several technical principles proved repeatedly beneficial in our series.

First, patellar eversion should be progressive rather than forceful. Aggressive patellar eversion risks avulsion of the patellar tendon in stiff hemophilic knees. A gentle, stepwise elevation technique, with gradual release of the medial retinaculum and controlled tension, provides safer exposure.

Second, performing the synovectomy early in the procedure significantly improves visualization and working space. In our previous series, early circumferential synovectomy reduced operating time, blood loss, and the risk of leaving behind vascularized synovial pannus behind the condyles. Synovectomy also softens the joint and facilitates mobilization during gap balancing.

Third, complete removal of posterior osteophytes is mandatory. Posterior osteophytes are disproportionately large in hemophilic knees and contribute to fixed flexion deformity. Their complete removal reduces flexion contracture, improves flexion gap symmetry, and decreases the need for excessive posterior capsular release.

Fourth, additional exposure-enhancing maneuvers should be used judiciously. In our operative logs, a quadriceps snip was performed in a small subset of very stiff knees, whereas tibial tubercle osteotomy was deliberately avoided due to the increased bleeding risk and potential for extensor mechanism complications. Extended medial release was used in knees with severe valgus deformity to gain access and improve balancing without compromising the extensor mechanism.

4.2. Bone Loss Management: Detailed Reconstruction Techniques

Bone loss in hemophilic knees is often irregular, asymmetric, and associated with osteopenia. Subchondral cysts, metaphyseal expansion, and distal femoral "cupping" are common. Effective reconstruction requires a structured and conservative strategy.

Our philosophy is based on minimal bone resection. Conservative cuts preserve bone stocks and reduce the need for highly constrained prostheses. This approach is particularly relevant in younger hemophilic patients in their thirties or forties, who will likely outlive their first prosthesis and may require future revision surgery.

4.3. Soft-Tissue Balancing: Addressing Severe Deformities

Hemophilic knees frequently present with valgus deformity due to lateral cartilage erosion, fixed flexion contracture due to posterior capsular fibrosis, and complex soft-tissue contractures. Correction of these deformities must be achieved without over-resecting bones or over-releasing ligaments.

Posterior capsular release emerged as a superior strategy for correcting flexion deformity when compared with excessive distal femoral resection. In our previous clinical series, posterior capsular release corrected most flexion contractures, whereas excessive distal femoral resection resulted in mid-flexion instability and a greater need for more constrained implants.

A standardized release sequence proved highly effective: first, synovectomy; second, removal of posterior osteophytes; third, posterior capsular release; and fourth, selective medial or lateral ligament balancing. This logical sequence corrected most deformities while preserving as much soft-tissue integrity as possible.

Implant constraint was selected based on residual ligament integrity. Posterior-stabilized designs were sufficient for knees once proper balancing was achieved. Rotating hinge implants were used in extreme cases with global ligament insufficiency or non-reconstructible bone loss.

4.4. Hemostasis: High-Yield Techniques Proven in Our Cohort

Bleeding is the most defining challenge of hemophilic total knee arthroplasty. Even with modern coagulation factor replacement and tranexamic acid, diffuse microvascular bleeding remains a threat.

Drain placement for twelve to twenty-four hours represented an optimal compromise in our cohort. Prolonged drainage increased transfusion requirements, whereas omission of drains in early years was associated with a higher frequency of clinically significant hematomas. A short-term drain allowed evacuation of residual blood while minimizing ongoing losses.

Our best-performing tranexamic acid protocol consisted of one gram administered intravenously before incision, one gram intravenously at closure.

4.5. Rehabilitation: Practical Adjustments for Hemophilia

Rehabilitation in hemophilic patients must balance the need for early mobilization with the risk of postoperative bleeding. Immediate aggressive flexion therapy was associated with an increased risk of hemarthrosis in the early phase of our clinical experience and was therefore abandoned.

A more cautious protocol was adopted: gentle range-of-motion exercises and isometric quadriceps activation were initiated on the first postoperative day, but intensive flexion efforts were delayed until approximately the third to fifth postoperative day, once wound stability and coagulation factor levels were secure.

Maintaining coagulation factor levels above forty percent during the first ten to fourteen postoperative days was critical [19]. Whenever factor levels dropped prematurely, we observed an increased incidence of hemarthrosis, stiffness, and prolonged hospital stays. Close coordination with the hematology team and strict adherence to replacement schedules were therefore essential components of rehabilitation.

4.6. Strengths and Clinical Implications

The strengths of our study include prospective data collection, a standardized surgical technique performed by the same experienced surgeon, and a consistent perioperative hemostatic protocol. The exclusive focus on hemophilic patients allows an in-depth analysis of disease-specific issues without confounding from other etiologies.

From a clinical standpoint, our experience confirms that total knee arthroplasty in hemophilia, although demanding, can achieve excellent pain relief, deformity correction, and durable function when performed in specialized centers. Surgeons should anticipate extended operative times, the need for augments and stems, and a higher transfusion requirement. Implementing the detailed tips and strategies presented in this discussion can reduce complications and improve outcomes.

4.7. Limitations

The main limitations of this study are the relatively small sample size inherent to the rarity of hemophilia and the single-center design. Advanced imaging, such as computed tomography for detailed evaluation of bone defects, was not used systematically. Radiographic scoring systems for arthropathy severity, such as the Hemophilia Joint Health Score, were not applied routinely in this cohort.

Nevertheless, the consistency of our findings with larger international series and the long duration of follow-up support the external validity of our observations. Future multicenter registries with standardized imaging and outcome measures are needed to refine surgical algorithms and prosthesis selection in hemophilic total knee arthroplasty.

4.8. Summary of Practical Recommendations

In summary, total knee arthroplasty in hemophilia requires meticulous surgical planning and execution. Key practical recommendations from our experience include progressive patellar eversion, early and complete synovectomy, systematic posterior osteophyte removal, conservative bone resection, structured soft-tissue balancing with emphasis on posterior capsular release, careful selection of implant constraint, rigorous hemostasis combined intravenous tranexamic acid, short-term drain use, and delayed but structured rehabilitation under adequate coagulation factor coverage.

5. Conclusions

Total knee arthroplasty in hemophilic patients is safe and effective when specialized surgical techniques, comprehensive synovectomy, precise deformity correction, optimized hemostasis, and structured postoperative coagulation factor replacement are implemented. Functional outcomes and prosthetic survival are excellent in experienced centers. The present study consolidates extensive clinical experience into a practical and detailed framework intended to help surgeons navigate the unique challenges of total knee arthroplasty in hemophilia and to improve outcomes in this rare but complex patient population.

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