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# TERAPIA COM IMPLANTES DENTÁRIOS EM PACIENTES COM DOENÇA HEPÁTICA CRÔNICA: CONSIDERAÇÕES CLÍNICAS, MOMENTO IDEAL E SEGURANÇA

# DENTAL IMPLANT THERAPY IN PATIENTS WITH CHRONIC LIVER DISEASE: CLINICAL CONSIDERATIONS, TIMING, AND SAFETY

# TERAPIA CON IMPLANTES DENTALES EN PACIENTES CON ENFERMEDAD HEPÁTICA CRÓNICA: CONSIDERACIONES CLÍNICAS, MOMENTO ADECUADO Y SEGURIDAD

**Nathália Duarte Barros Rocha[1]; Glaucia Valias Filgueiras[1]; Alice Maria Machado Costa[2]; Guilherme da Silva Gomes[2]; Bruna Ferreira Aniceto[2]; Paola Ferreira Galito[3]; Márcio Eduardo Vieira Falabella[4]; Thiago Borges Mattos[5]**

1 Mestre, Universidade Federal de Juiz de Fora, Brasil

2 Graduando, Universidade Federal de Juiz de Fora, Brasil

3 Mestre, Centro Universitário UninCor, Brasil

4 Doutorado, Universidade Federal de Juiz de Fora, Brasil

5 Doutorado, Centro Universitário UninCor, Brasil

E-mail: drthiagomattos@hotmail.com

## RESUMO

**Objetivo:** Analisar criticamente as evidências atuais sobre a terapia com implantes dentários em pacientes com doença hepática crônica, com ênfase nos fatores sistêmicos e biológicos, risco hemostático, metabolismo ósseo, saúde peri-implantar, aspectos farmacológicos, momento adequado para o tratamento e transplante hepático. **Métodos:** Foi realizada uma revisão narrativa crítica com buscas direcionadas na literatura biomédica e nas recomendações contemporâneas em hepatologia e transplante. A busca bibliográfica foi inicialmente conduzida nas bases PubMed, Scopus e Web of Science e atualizada em 5 de setembro de 2026. Foram priorizadas publicações em língua inglesa que abordassem doença hepática crônica, cirrose, transplante hepático, cirurgia oral, implantes dentários, osseointegração, doenças peri-implantares, hemostasia, saúde óssea e manejo farmacológico. As evidências foram ponderadas de acordo com sua força metodológica e aplicabilidade direta à terapia com implantes; quando não havia



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evidências específicas sobre implantes, foram utilizadas explicitamente como evidências indiretas informações provenientes da cirurgia oral, hepatologia e transplante. **Resultados:** A doença hepática crônica pode modificar o tratamento com implantes em decorrência de alterações hemostáticas, hipertensão portal, disfunção renal, comprometimento nutricional, alterações do metabolismo ósseo, disfunção imunológica, aspectos relacionados ao uso de medicamentos e doenças orais associadas. As evidências diretamente relacionadas aos implantes permanecem limitadas. Em pacientes cirróticos com implantes em função há mais de cinco anos, um estudo caso-controle identificou peri-implantite em 29,7% dos pacientes, em comparação com 18,0% dos controles, além de uma associação ajustada de aproximadamente 2,5 vezes, indicando que a saúde peri-implantar a longo prazo merece atenção mesmo quando a osseointegração inicial é alcançada. O INR isoladamente não deve determinar o risco de sangramento relacionado ao procedimento, e nenhum ponto de corte laboratorial universal específico para a instalação de implantes foi validado. A instalação eletiva de implantes não deve, em geral, ser realizada durante a descompensação hepática ativa. Antes do transplante hepático, o controle das infecções orais deve ser priorizado, e tratamentos odontológicos não urgentes não devem atrasar um transplante potencialmente salvador. Após o transplante, a terapia com implantes pode ser considerada em receptores clinicamente estáveis e cuidadosamente selecionados, com o momento do tratamento determinado pela estabilidade do enxerto e das condições sistêmicas, e não por um intervalo de espera universal. **Conclusão:** A doença hepática crônica deve ser considerada um modificador do risco do tratamento com implantes, e não uma contraindicação automática. As decisões devem integrar a gravidade e a estabilidade da doença, o estado hemostático e renal, o estado nutricional e a fragilidade, a saúde periodontal e peri-implantar, o perfil medicamentoso, a situação do transplante e a complexidade do procedimento.

**Palavras-chave:** Implantes Dentários; Doenças Hepáticas; Cirrose Hepática; Transplante Hepático; Peri-Implantite; Osseointegração.

## ABSTRACT

Objective: To critically analyze current evidence regarding dental implant therapy in patients with chronic liver disease, with emphasis on systemic and biological factors, hemostatic risk, bone metabolism, peri-implant health, pharmacological considerations, treatment timing, and liver transplantation. Methods: A critical narrative review was performed using targeted searches of biomedical literature and contemporary hepatology and transplant guidance. The literature search was initially conducted in PubMed, Scopus, and Web of Science and was updated on September 5, 2026. English-language publications addressing chronic



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liver disease, cirrhosis, liver transplantation, oral surgery, dental implants, osseointegration, peri-implant disease, hemostasis, bone health, and pharmacological management were prioritized. Evidence was weighted according to methodological strength and directness to implant therapy; when implant-specific evidence was unavailable, related oral-surgery, hepatology, and transplant evidence was used explicitly as indirect evidence. Results: Chronic liver disease may modify implant treatment through hemostatic alterations, portal hypertension, renal dysfunction, nutritional impairment, altered bone metabolism, immune dysfunction, medication-related considerations, and associated oral disease. Direct implant evidence remains limited. In cirrhotic patients with implants already in function for more than five years, one case-control study found peri-implantitis in 29.7% versus 18.0% of controls and an adjusted association of approximately 2.5-fold, indicating that long-term peri-implant health deserves attention even when initial osseointegration is achieved. INR alone should not determine procedural bleeding risk, and no universal implant-specific laboratory cutoff has been validated. Elective implant placement should not ordinarily proceed during active hepatic decompensation. Before liver transplantation, oral infection control should be prioritized and nonurgent dental treatment should not delay a life-saving transplant. After transplantation, implant therapy may be considered in medically stable, carefully selected recipients, with timing determined by graft and systemic stability rather than a universal waiting interval. Conclusion: Chronic liver disease is best regarded as a modifier of implant treatment risk rather than an automatic contraindication. Decisions should integrate disease severity and stability, hemostatic and renal status, nutrition and frailty, periodontal and peri-implant health, medication profile, transplant status, and procedural complexity. (COSTA et al., 2022; PAREDES et al., 2018; CHEN; TANG; LIAO, 2025)

Keywords: Dental Implants; Liver Diseases; Liver Cirrhosis; Liver Transplantation; Peri-Implantitis; Osseointegration.

## RESUMEN

**Objetivo:** Analizar críticamente la evidencia actual sobre la terapia con implantes dentales en pacientes con enfermedad hepática crónica, con énfasis en los factores sistémicos y biológicos, el riesgo hemostático, el metabolismo óseo, la salud periimplantaria, las consideraciones farmacológicas, el momento adecuado para el tratamiento y el trasplante hepático. **Métodos:** Se realizó una revisión narrativa crítica mediante búsquedas dirigidas en la literatura biomédica y en las recomendaciones contemporáneas de hepatología y trasplante. La búsqueda bibliográfica se realizó inicialmente en las bases de datos PubMed, Scopus y Web of Science y se actualizó el 5 de septiembre de 2026. Se priorizaron publicaciones en



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inglés que abordaran la enfermedad hepática crónica, la cirrosis, el trasplante hepático, la cirugía oral, los implantes dentales, la osteointegración, las enfermedades periimplantarias, la hemostasia, la salud ósea y el manejo farmacológico. La evidencia se ponderó de acuerdo con su solidez metodológica y su aplicabilidad directa a la terapia con implantes; cuando no se dispuso de evidencia específica sobre implantes, se utilizaron explícitamente como evidencia indirecta datos procedentes de la cirugía oral, la hepatología y el trasplante. **Resultados:** La enfermedad hepática crónica puede modificar el tratamiento con implantes debido a alteraciones hemostáticas, hipertensión portal, disfunción renal, deterioro nutricional, alteraciones del metabolismo óseo, disfunción inmunológica, consideraciones relacionadas con los medicamentos y enfermedades orales asociadas. La evidencia directamente relacionada con los implantes sigue siendo limitada. En pacientes cirróticos con implantes en función durante más de cinco años, un estudio de casos y controles encontró periimplantitis en el 29,7% de los pacientes frente al 18,0% de los controles, además de una asociación ajustada de aproximadamente 2,5 veces, lo que indica que la salud periimplantaria a largo plazo merece especial atención incluso cuando se logra una osteointegración inicial. El INR por sí solo no debe determinar el riesgo de sangrado relacionado con el procedimiento, y no se ha validado ningún punto de corte de laboratorio universal específico para la colocación de implantes. La colocación electiva de implantes no debería realizarse, por lo general, durante una descompensación hepática activa. Antes del trasplante hepático, debe priorizarse el control de las infecciones orales, y los tratamientos odontológicos no urgentes no deben retrasar un trasplante potencialmente vital. Después del trasplante, la terapia con implantes puede considerarse en receptores médicamente estables y cuidadosamente seleccionados, determinándose el momento del tratamiento según la estabilidad del injerto y del estado sistémico, y no mediante un intervalo de espera universal. **Conclusión:** La enfermedad hepática crónica debe considerarse un modificador del riesgo del tratamiento con implantes, y no una contraindicación automática. Las decisiones deben integrar la gravedad y estabilidad de la enfermedad, el estado hemostático y renal, el estado nutricional y la fragilidad, la salud periodontal y periimplantaria, el perfil farmacológico, el estado del trasplante y la complejidad del procedimiento.

**Palabras clave:** Implantes Dentales; Enfermedades Hepáticas; Cirrosis Hepática; Trasplante Hepático; Periimplantitis; Osteointegración.



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## INTRODUCTION

Chronic liver disease encompasses a heterogeneous spectrum ranging from chronic hepatitis and metabolic dysfunction-associated steatotic liver disease to advanced fibrosis and cirrhosis. As liver dysfunction progresses, patients may develop portal hypertension, altered hemostasis, renal dysfunction, immune dysfunction, malnutrition, sarcopenia, impaired drug metabolism, and skeletal abnormalities, all of which may influence the planning of invasive dental care. (GUAÑABENS; PARÉS, 2018; DANFORD; TRIVEDI; BONDER, 2020; SHIRINEZHAD et al., 2025)

Dental implant therapy is a predictable rehabilitation modality in appropriately selected patients, but its outcomes depend on several distinct domains: primary osseointegration and early implant stability; long-term implant survival; peri-implant mucosal and bone health; prevention and management of peri-implant disease; and tolerance of the surgical procedure itself. These outcomes should not be treated as interchangeable. (PAREDES et al., 2018; GU; YU, 2011; COSTA et al., 2022)

The biological consequences of chronic liver disease provide plausible reasons for concern. Hepatic osteodystrophy, osteoporosis, nutritional impairment, and systemic inflammation may affect bone remodeling and wound healing. However, systemic bone disease does not by itself establish impaired dental implant osseointegration, and direct implant-specific evidence in non-transplanted cirrhotic populations remains scarce. (GUAÑABENS; PARÉS, 2018; DANFORD; TRIVEDI; BONDER, 2020; SHIRINEZHAD et al., 2025)

Bleeding risk is another important consideration. Cirrhosis is characterized by a complex, rebalanced hemostatic system in which procoagulant and anticoagulant pathways may both be altered. Accordingly, an elevated INR should not be interpreted as an isolated measure of procedural bleeding risk. At the same time, the limitations of INR do not eliminate the need to assess platelet count, fibrinogen when clinically indicated, renal function, infection, antithrombotic medication, anemia, prior bleeding, and the clinical severity of liver disease. (NORTHUP et al., 2021; RECH et al., 2021; MEDINA et al., 2018)

Oral health may represent an additional pathway linking liver disease to implant outcomes. A systematic review and meta-analysis found poorer periodontal parameters and a higher prevalence of periodontitis in cirrhotic patients. More directly, Costa et al. reported an association between cirrhosis and peri-implantitis among patients with implants in function for more than five years. This evidence shifts part of the clinical focus from whether an implant can initially integrate to whether peri-implant tissues can be maintained over the long term. (BIE et al., 2023; COSTA et al., 2022)



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Transplantation creates a distinct clinical context. Before transplantation, dental evaluation is part of candidate assessment, but a life-saving transplant should not be delayed for nonurgent dental treatment. After transplantation, long-term immunosuppression does not appear to preclude implant survival in carefully selected patients, although early post-transplant instability, infection risk, graft function, renal dysfunction, and medication interactions require careful timing. (DOVE et al., 2026; CHEN; TANG; LIAO, 2025; NIDCR, 2022)

This critical narrative review therefore evaluates dental implant therapy across the clinical spectrum of chronic liver disease, explicitly distinguishing direct implant evidence from indirect evidence and separating surgical safety, osseointegration, implant survival, and peri-implant health. (COSTA et al., 2022; DOVE et al., 2026)

## METHODS

### Study design

This study was designed as a critical narrative review to synthesize evidence relevant to clinical decision-making for dental implant therapy in patients with chronic liver disease. It was not designed as a systematic review or meta-analysis, and no quantitative pooled estimate of implant survival in liver disease was attempted.

### Literature search and selection

The literature search was initially conducted in PubMed, Scopus, and Web of Science and was updated on September 5, 2026. Search concepts combined terms related to liver disease and implant dentistry, including combinations of “liver disease,” “chronic liver disease,” “cirrhosis,” “liver transplantation,” “dental implants,” “implant therapy,” “osseointegration,” “peri-implantitis,” “peri-implant disease,” “oral surgery,” “bleeding,” “hemostasis,” “bone metabolism,” and “analgesia.” Searches were supplemented by reference-list screening and targeted consultation of current guidance from hepatology, gastroenterology, transplantation, and dental institutions.

The search considered publications from database inception through the final search date. English-language publications were prioritized because they contained the principal implant-specific and hepatology guidance identified for this review. Eligible evidence included clinical studies, prospective and retrospective observational studies, systematic reviews and meta-analyses, clinical practice guidelines, practice guidance, and clinically relevant narrative reviews. Case reports and very small case series were retained only when they provided unique long-term or clinically informative implant evidence not otherwise available. Studies were excluded when they were unrelated to dental/oral surgery, liver disease, transplantation, or the clinical domains required for implant decision-making.



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Because this was a critical narrative review, selection was purposive rather than based on a formal risk-of-bias scoring system. Evidence was weighted according to study design, sample size, methodological rigor, directness to dental implant therapy, and clinical applicability. Direct implant-specific clinical evidence was prioritized over indirect evidence from tooth extraction, non-dental surgery, systemic bone disease, or general cirrhosis management. When evidence was indirect, this was explicitly stated in the synthesis. Contemporary professional guidance was used to contextualize perioperative risk, hemostasis, analgesia, and transplantation timing.

### Evidence hierarchy and synthesis

For the purposes of interpretation, evidence was considered in the following practical hierarchy: (1) direct clinical studies of dental implants in patients with liver disease or liver transplantation; (2) systematic reviews/meta-analyses of implant outcomes in transplant recipients or peri-implant disease in cirrhosis; (3) hepatology/transplant guidelines and perioperative practice guidance; (4) clinical studies of oral surgery or dental extraction in cirrhosis; (5) evidence concerning systemic bone, nutritional, or periodontal effects of liver disease; and (6) expert narrative reviews. Lower-level or indirect evidence was not treated as equivalent to direct implant evidence.

### Scope

The evidence was synthesized across six clinical domains: disease severity and systemic reserve; hemostatic and surgical risk; bone metabolism and osseointegration; pharmacological considerations; peri-implant health and long-term maintenance; and implant timing before and after liver transplantation.

## CHRONIC LIVER DISEASE AND CLINICAL RELEVANCE TO IMPLANT THERAPY

Chronic liver disease should not be treated as a single surgical-risk category. Patients may range from individuals with compensated disease and preserved functional reserve to patients with decompensated cirrhosis, clinically significant portal hypertension, renal dysfunction, infection, frailty, or acute-on-chronic liver failure. For perioperative communication, severity may be described using compensated/decompensated status, history of decompensation, Child-Turcotte-Pugh class, MELD or MELD 3.0, and the presence of clinically significant portal hypertension when available. These measures are not dental implant eligibility scores and should not be converted into automatic implant cutoffs (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

Compensated disease does not necessarily mean low risk. A patient without overt ascites or encephalopathy may still have thrombocytopenia, portal



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**Pages:** 1-21

hypertension, renal impairment, diabetes, frailty, malnutrition, or antithrombotic therapy. Conversely, the absence of a single abnormal laboratory result does not establish procedural safety. The appropriate question is whether the patient's current systemic reserve is adequate for the specific elective procedure being proposed (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

Advanced liver disease may also be accompanied by sarcopenia, malnutrition, and frailty. These features should be interpreted as markers of reduced systemic reserve rather than implant-specific contraindications. Marked frailty, significant nutritional compromise, or progressive systemic instability may favor postponement or simplification of elective rehabilitation (DOVE et al., 2026).

Oral health is an important modifiable domain. Cirrhotic patients have a higher burden of periodontal disease, and active periodontal inflammation or poor plaque control can compromise long-term peri-implant health. Oral infection should therefore be treated and periodontal stability established before elective implantation whenever feasible (BIE et al., 2023; COSTA et al., 2022).

Procedure complexity should be explicitly incorporated into the risk assessment. A single implant placed in healed bone under limited flap elevation is not equivalent to multiple implants, extensive flap surgery, guided bone regeneration, sinus augmentation, or full-arch reconstruction. As surgical burden increases, the potential consequences of bleeding, infection, wound-healing problems, and medication-related complications also increase (NORTHUP; FRIEDMAN; KAMATH, 2019; RECH et al., 2021).

## HEMOSTATIC ALTERATIONS AND BLEEDING RISK

Cirrhosis produces a rebalanced hemostatic state rather than simple hypocoagulation. Procoagulant and anticoagulant factors may both be reduced, while thrombocytopenia, altered platelet function, hyperfibrinolysis in selected settings, portal hypertension, renal dysfunction, infection, and systemic inflammation may modify bleeding and thrombotic risk. The presence of a prolonged INR therefore should not be interpreted as equivalent to therapeutic anticoagulation or as a stand-alone predictor of procedural bleeding (NORTHUP et al., 2021).

Contemporary hepatology guidance states that INR should not be used in isolation to gauge procedural bleeding risk in patients with cirrhosis who are not taking vitamin K antagonists, that there is no universal INR target for preprocedural correction, and that prophylactic plasma transfusion simply to normalize INR is not recommended. At the same time, this principle does not mean that laboratory evaluation is unnecessary. Platelet count, fibrinogen when clinically indicated, renal function, active infection, antithrombotic therapy, anemia, previous bleeding, and the



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clinical severity of cirrhosis remain relevant to patient assessment (NORTHUP et al., 2021).

Professional recommendations regarding thrombocytopenia before high-risk procedures are not uniform. Thresholds around 30–50 × 10^9/L appear in different procedural guidance, but these values are not validated dental implant thresholds. They should therefore be interpreted as context-dependent procedural guidance rather than automatic criteria for implant placement (NORTHUP et al., 2021).

Evidence from dental extractions provides useful but indirect information. Medina et al. evaluated 333 extractions performed during 190 visits in cirrhotic patients with platelet counts ranging from 16,000 to 216,000/μL and INR below 3; bleeding events were managed with local measures. This study does not establish that 16,000/μL is a safe platelet threshold for implant surgery. The lowest platelet counts reported in extraction cohorts should not be interpreted as validated safety thresholds for implant surgery (MEDINA et al., 2018).

Likewise, systematic reviews of oral surgery in cirrhosis suggest that clinically significant bleeding is often manageable with local measures in selected patients. However, implant placement involves osteotomy preparation, implant insertion, and sometimes flap elevation or augmentation, and therefore cannot be assumed to have the same bleeding profile as extraction (RECH et al., 2021; MEDINA et al., 2018; EFEOĞLU et al., 2018).

Before elective implant surgery, the clinician should therefore characterize liver severity and stability, bleeding history, platelet count, fibrinogen when clinically indicated, renal function, infection, antithrombotic medications, anemia, and the complexity of the planned procedure. When clinically important abnormalities or uncertainty are present, coordination with hepatology or the transplant team is appropriate. Local hemostatic measures and atraumatic technique remain important, but they should complement rather than replace systemic risk assessment (NORTHUP et al., 2021; NORTHUP; FRIEDMAN; KAMATH, 2019).

## BONE METABOLISM, HEALING, AND OSSEOINTEGRATION

Chronic liver disease may be associated with hepatic osteodystrophy, reduced bone mineral density, osteoporosis, and increased fracture risk. Recent meta-analytic evidence confirms a substantial burden of osteoporosis and fractures among patients with cirrhosis. These findings provide biological plausibility for concern about bone quality and healing, but they do not demonstrate that systemic osteoporosis causes dental implant failure (GUAÑABENS; PARÉS, 2018; DANFORD; TRIVEDI; BONDER, 2020; SHIRINEZHAD et al., 2025).



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Primary osseointegration should therefore be distinguished from long-term implant survival and peri-implant disease. Current evidence does not establish chronic liver disease as a direct cause of impaired osseointegration. In transplant recipients, prospective and case-series data have reported favorable implant survival after successful healing. In cirrhotic patients without transplantation, direct evidence concerning primary osseointegration is much more limited (PAREDES et al., 2018; GU; YU, 2011; CHEN; TANG; LIAO, 2025).

Systemic nutritional impairment, sarcopenia, inflammation, diabetes, smoking, alcohol exposure, and other comorbidities may independently affect wound healing and implant outcomes. The etiology and severity of liver disease should therefore be considered together with local bone anatomy and the need for regenerative procedures (DANFORD; TRIVEDI; BONDER, 2020; DOVE et al., 2026).

When severe systemic instability or major nutritional compromise is present, a conservative or staged rehabilitation plan may be preferable. Radiographic assessment should focus on local bone availability and anatomy, while systemic bone findings should be interpreted as potential modifiers rather than automatic contraindications (DANFORD; TRIVEDI; BONDER, 2020; DOVE et al., 2026).

## PERI-IMPLANT HEALTH AND LONG-TERM OUTCOMES

One of the most important additions to the evidence base is the case-control study by Costa et al., which directly evaluated peri-implant disease in patients with cirrhosis. The study included 64 individuals with cirrhosis and 128 controls with implants in function for more than five years. Peri-implantitis was observed in 29.7% of cirrhotic patients compared with 18.0% of controls, and cirrhosis remained associated with approximately 2.5-fold higher odds of peri-implantitis after multivariable adjustment (COSTA et al., 2022).

This study should not be interpreted as evidence that cirrhosis prevents initial osseointegration or causes early implant failure. It evaluated patients with established implants and therefore speaks primarily to long-term peri-implant health. Its case-control design demonstrates association rather than causality, and residual confounding by factors such as age, smoking, alcohol exposure, periodontitis, and other implant-related variables remains possible (COSTA et al., 2022).

Nevertheless, the finding changes the clinical emphasis of implant planning. The relevant outcomes are not only whether an implant integrates initially, but also whether peri-implant tissues remain healthy over time. Cirrhosis may coexist with a higher burden of periodontitis, altered immune responses, smoking or alcohol exposure, metabolic disease, and challenges in oral hygiene. These factors reinforce



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the need for periodontal stabilization before implantation and structured peri-implant maintenance afterward (COSTA et al., 2022; BIE et al., 2023).

Accordingly, patients with chronic liver disease should be counseled that favorable implant survival in selected patients does not eliminate the need for long-term maintenance. Regular supportive periodontal/peri-implant care, plaque control, monitoring of probing and inflammatory changes, and early management of peri-implant disease are particularly relevant in this population (COSTA et al., 2022; BIE et al., 2023).

## PHARMACOLOGICAL CONSIDERATIONS

Hepatic dysfunction may alter drug metabolism, protein binding, and elimination. The implications depend on the degree of liver dysfunction and on concomitant renal disease, alcohol exposure, nutritional status, and other medications. Medication decisions should therefore be based on the patient's clinical phenotype rather than the diagnosis of chronic liver disease alone (ROGAL et al., 2022; CANCINO; LAZO; FONSECA, 2023).

For patients with cirrhosis, contemporary hepatology guidance identifies acetaminophen as the preferred first-line systemic analgesic when clinically appropriate, generally at a reduced total daily dose of up to 2 g/day. This recommendation should not be generalized automatically to every form of chronic liver disease or every clinical circumstance; alcohol use, malnutrition, severity of hepatic dysfunction, concomitant acetaminophen-containing products, and medical advice should be considered (ROGAL et al., 2022).

Systemic NSAIDs should generally be avoided in patients with cirrhosis, particularly in the presence of portal hypertension, ascites, renal dysfunction, or decompensated disease, because of concerns regarding renal injury, gastrointestinal bleeding, platelet effects, and sodium retention. Their routine use after implant surgery should therefore not be assumed to be appropriate in cirrhotic patients (ROGAL et al., 2022).

Antibiotic prophylaxis should not be prescribed solely because a patient has chronic liver disease. When antimicrobials are clinically indicated, selection and dosing should consider hepatic and renal function, hepatotoxicity, and drug interactions. In transplant recipients, interactions with calcineurin inhibitors and other immunosuppressive agents may be clinically important (CANCINO; LAZO; FONSECA, 2023; ROGAL et al., 2022).

Local anesthetics should be discussed as a pharmacokinetic principle rather than through an implant-specific dosing protocol. In significant hepatic impairment, the clinician should minimize unnecessary total exposure, avoid unnecessarily



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prolonged procedures, consider cardiovascular and renal comorbidity, and select and dose the agent according to hepatic function and the specific clinical context. A universal dose-reduction protocol cannot be established from the available implant literature (CANCINO; LAZO; FONSECA, 2023).

Overall, pharmacological planning should aim to avoid unnecessary medication, reduce exposure to agents with predictable renal or hepatic toxicity, and identify clinically important interactions before treatment (ROGAL et al., 2022; CANCINO; LAZO; FONSECA, 2023).

## IMPLANT THERAPY IN COMPENSATED AND DECOMPENSATED LIVER DISEASE

In compensated disease, implant therapy may be considered when the patient has adequate systemic reserve, stable liver disease, controlled oral disease, and no major uncontrolled complication. Assessment should include history of previous decompensation, clinically significant portal hypertension when known, renal function, medications, nutritional and functional status, bleeding history, and the anticipated complexity of surgery (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

Compensated status should not be interpreted as a blanket authorization for implant placement. Patients may still have substantial portal hypertension, thrombocytopenia, renal dysfunction, diabetes, frailty, antithrombotic therapy, or other factors that materially alter risk (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

Elective implant placement should not ordinarily proceed during active hepatic decompensation. Active or poorly controlled ascites, hepatic encephalopathy, recent variceal bleeding, acute kidney injury, active infection, severe nutritional compromise, acute-on-chronic liver failure, or progressive systemic deterioration represent contexts in which the elective nature of implant therapy generally favors stabilization first and reassessment later (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

This is not a permanent contraindication. Once the precipitating complications have been controlled or after transplantation, the patient's candidacy can be reassessed. The central principle is to match the invasiveness of the proposed procedure to the patient's current systemic reserve (DOVE et al., 2026; NORTHUP; FRIEDMAN; KAMATH, 2019).

Procedure complexity should be explicitly categorized during planning. A single implant in healed bone is clinically different from multiple implants, extensive flap surgery, guided bone regeneration, sinus lift, or full-arch reconstruction. When



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**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

systemic risk is increased, staged or simplified rehabilitation may reduce the burden of elective surgery (NORTHUP; FRIEDMAN; KAMATH, 2019; RECH et al., 2021).

## PATIENTS AWAITING LIVER TRANSPLANTATION: TIMING AND PRIORITIES

The 2026 AASLD/AST Practice Guideline on adult liver transplantation recommends that dental evaluation be included in liver transplant candidate assessment when the patient is stable for examination. Importantly, a life-saving transplant should not be delayed for nonurgent dental treatment. The guideline also notes that patients with high MELD and/or high bleeding risk may have dental procedures deferred until after transplantation (DOVE et al., 2026).

Before transplantation, dental care should therefore prioritize identification and management of active oral infection and stabilization of oral conditions that could become clinically important. Periodontal disease, endodontic infection, nonrestorable teeth, and other potential infectious foci should be addressed when medically feasible and without compromising transplant timing (DOVE et al., 2026; CANCINO; LAZO; FONSECA, 2023).

Elective implant therapy should ordinarily be deferred during the pre-transplant period. Implant placement requires healing and subsequent restorative and maintenance phases, while the timing of transplantation may be unpredictable. In addition, patients with high MELD or high bleeding risk may have elective dental procedures deferred according to transplant guidance (DOVE et al., 2026; NIDCR, 2022).

Exceptional consideration could be given only to highly selected, medically stable patients after discussion with the transplant team and when transplantation is not anticipated during the foreseeable healing period. Even in such circumstances, the indication should be compelling and the procedure should be as conservative as clinically appropriate (DOVE et al., 2026; NIDCR, 2022).

The transplant team's assessment of disease severity, bleeding risk, expected timing of transplantation, and overall prognosis should take precedence over elective implant rehabilitation. Implant treatment should never delay a life-saving transplant (DOVE et al., 2026).

## LIVER TRANSPLANT RECIPIENTS: IMPLANT THERAPY AFTER TRANSPLANTATION

Available direct evidence is more reassuring in stable liver transplant recipients than in non-transplanted cirrhosis. Paredes et al. conducted a prospective-controlled study involving 16 pharmacologically immunosuppressed liver transplant recipients



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

who received 52 implants and 16 matched controls who received 54 implants. After more than eight years of mean follow-up, implant survival was 100% in transplant recipients and 98.15% in controls, with early postoperative complications similar between groups (PAREDES et al., 2018).

Gu and Yu reported 45 implants in 13 liver transplant recipients, with no implant losses at three years and acceptable clinical parameters. These findings support feasibility in selected recipients receiving stable long-term immunosuppression (GU; YU, 2011).

Heckmann et al. provide a much lower level of evidence: a 10-year longitudinal observation of one 71-year-old liver transplant recipient with two mandibular implants. This report is clinically informative because of its long follow-up, but it should not be interpreted as population-level evidence and should not be weighted equivalently to prospective-controlled or larger case-series evidence (HECKMANN et al., 2004).

Chen et al. synthesized 12 studies involving 110 solid-organ transplant recipients and 290 implants, with an overall implant survival rate of 99.3%. The meta-analysis included recipients of different solid organs rather than liver-only populations and was based on selected patients and heterogeneous studies. Thus, the evidence supports the statement that high implant survival has been observed in medically stable and carefully selected solid-organ transplant recipients, but it does not guarantee individual safety or establish liver-specific outcomes for every transplant recipient (CHEN; TANG; LIAO, 2025).

Timing after transplantation requires particular caution. No implant-specific universal waiting interval has been established. Nevertheless, the early post-transplant period—particularly approximately the first three months—is generally not an appropriate time for elective implant surgery because immunosuppression is intensive and graft and systemic stability are still being evaluated. Institutional dental-transplant guidance commonly recommends avoiding elective dental treatment during this early period and notes that graft stabilization often occurs over approximately three to six months (NIDCR, 2022; DOVE et al., 2026).

After the early period, the decision should be based on graft function, immunosuppressive regimen and intensity, rejection history, active or recurrent infection, renal function, metabolic complications, nutritional and functional status, oral health, and the complexity of the proposed rehabilitation. The transplant team should clear the patient for elective invasive dental care (PAREDES et al., 2018; DOVE et al., 2026).

Immunosuppression itself should not be treated as an automatic contraindication. Instead, stable long-term immunosuppression appears compatible with favorable implant outcomes in selected patients. Long-term maintenance



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

remains essential because peri-implant disease can compromise outcomes even after successful osseointegration (PAREDES et al., 2018; CHEN; TANG; LIAO, 2025).

**TABLE 1. Author-proposed clinical framework based on the reviewed evidence**

| Clinical scenario | Main concerns | Implant approach | Key clinical considerations | Evidence basis / limitations |
|---|---|---|---|---|
| Compensated chronic liver disease | Portal hypertension, thrombocytopenia, renal dysfunction, diabetes, frailty, antithrombotics, nutritional status | May be considered in selected stable patients | Assess liver severity/stability, oral health, systemic reserve and procedure complexity; no implant-specific MELD/Child-Pugh cutoff | General cirrhosis perioperative guidance; limited direct implant evidence (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026) |
| Active decompensated cirrhosis | Ascites, encephalopathy, infection, renal dysfunction, recent variceal bleeding, ACLF, systemic instability | Elective implant placement should not ordinarily proceed | Stabilize first; manage urgent oral infection; reassess after medical optimization or transplantation | Indirect perioperative evidence; no implant-specific trials (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026) |
| Hemostatic abnormalities | Platelets, fibrinogen when indicated, INR limitations, renal dysfunction, infection, antithrombotics, bleeding history | Individualized assessment | No universal INR target or implant platelet cutoff; local hemostasis plus systemic assessment | AASLD guidance and oral-surgery evidence; indirect for implants (NORTHUP et al., 2021; RECH et al., 2021; MEDINA et al., 2018) |
| Bone metabolism / | Osteoporosis, malnutrition, sarcopenia, | Not an automatic contraindication | Assess local bone and systemic | Systemic bone evidence; limited direct |



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

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| systemic reserve | frailty, altered bone remodeling | | reserve; simplify/stage if systemic reserve is poor | osseointegration evidence (GUAÑABENS; PARÉS, 2018; DANFORD; TRIVEDI; BONDER, 2020; SHIRINEZHAD et al., 2025) |
| Periodontal / peri-implant disease | Higher periodontal burden; long-term peri-implantitis association | Implant therapy requires strong maintenance plan | Stabilize periodontal disease; emphasize plaque control and supportive peri-implant care | Direct case-control evidence for peri-implantitis; association not causation (COSTA et al., 2022; BIE et al., 2023) |
| Before liver transplantation | High MELD, bleeding risk, infection risk, unpredictable transplant timing | Ordinarily defer elective implant therapy | Prioritize oral infection control; do not delay life-saving transplant; exceptional consideration only after transplant-team discussion | AASLD/AST 2026 transplant guideline; dental/transplant guidance (DOVE et al., 2026; NIDCR, 2022) |
| Early after liver transplantation (~first 3 months) | Intensive immunosuppression, infection/rejection risk, graft instability | Generally defer elective implant surgery | Proceed only when transplant team confirms adequate stability | Institutional transplant-dental guidance; no implant-specific universal interval (NIDCR, 2022; DOVE et al., 2026) |
| Stable liver transplant recipient | Immunosuppression, renal dysfunction, drug interactions, rejection/infection history | May be considered in selected medically stable patients | Confirm graft/systemic stability; review medications and long-term maintenance capacity | Direct liver-transplant studies plus solid-organ transplant meta-analysis; selected |



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

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| | | | | populations (PAREDES et al., 2018; GU; YU, 2011; CHEN; TANG; LIAO, 2025) |
| Complex rehabilitation | Multiple implants, extensive flap surgery, GBR, sinus lift, full-arch reconstruction | Requires additional caution; consider staging | Match surgical burden to systemic reserve and hemostatic/infectious risk | Procedure-specific risk is largely extrapolated from general perioperative/oral-surgery evidence (NORTHUP; FRIEDMAN; KAMATH, 2019; RECH et al., 2021) |

Note: This table is an author-proposed clinical framework based on the reviewed evidence. It is not a validated clinical decision rule and should not be interpreted as establishing laboratory, MELD, Child-Pugh, or waiting-period cutoffs for implant therapy.

## DISCUSSION

The principal message of this review is that chronic liver disease is not a uniform exposure and should not be used as a binary implant contraindication. The clinical decision depends on disease severity, current stability, systemic reserve, oral health, medication profile, transplant status, and the magnitude of the proposed intervention (COSTA et al., 2022; DOVE et al., 2026; NORTHUP et al., 2021).

The revised evidence base also changes the emphasis of the manuscript. Direct evidence about primary implant placement in non-transplanted cirrhosis remains limited, but Costa et al. provide direct evidence that cirrhosis is associated with a higher prevalence of peri-implantitis among patients with established implants. This finding does not demonstrate impaired initial osseointegration. Instead, it highlights the importance of long-term biological maintenance and supports a treatment model in which periodontal stabilization and ongoing peri-implant care are integral components of implant therapy (COSTA et al., 2022).

The distinction among outcomes is therefore essential. Primary osseointegration and early surgical complications address the immediate ability to establish an implant. Implant survival describes retention over time. Peri-implant



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

mucositis and peri-implantitis describe biological complications during maintenance. Marginal bone loss is an outcome that may be influenced by both local and systemic factors. The available evidence does not support treating all of these outcomes as evidence of the same biological phenomenon (PAREDES et al., 2018; GU; YU, 2011; CHEN; TANG; LIAO, 2025; COSTA et al., 2022).

Hemostasis provides another example of why simplistic criteria are inadequate. The INR is not a reliable stand-alone predictor of procedural bleeding in cirrhosis and should not be normalized prophylactically simply because it is elevated. However, the patient still requires a clinical and laboratory assessment that includes thrombocytopenia, fibrinogen when indicated, renal dysfunction, infection, antithrombotic therapy, anemia, prior bleeding, and the clinical severity of liver disease. The goal is not to replace laboratory evaluation with clinical judgment, but to interpret laboratory findings within the physiology of cirrhosis (NORTHUP et al., 2021; RECH et al., 2021).

The use of extraction studies illustrates the importance of evidence hierarchy. Data showing that selected cirrhotic patients can undergo extractions with manageable bleeding are reassuring for oral surgical care, but they cannot establish the safety of osteotomy, bone augmentation, sinus lift, or full-arch implant surgery. The lowest platelet values observed in extraction cohorts are not implant thresholds (RECH et al., 2021; MEDINA et al., 2018; EFEOĞLU et al., 2018).

Severity assessment should also move beyond the compensated/decompensated label. Child-Turcotte-Pugh, MELD/MELD 3.0, history of decompensation, clinically significant portal hypertension, renal function, frailty, and nutritional status provide a more informative clinical picture. None has been validated as an implant eligibility score. Their purpose is to communicate systemic risk and identify patients in whom elective surgery should be reconsidered (NORTHUP; FRIEDMAN; KAMATH, 2019; DOVE et al., 2026).

The pre-transplant recommendation is now more clearly anchored in the 2026 AASLD/AST guideline. Dental evaluation belongs within transplant candidate assessment, and active oral infection should be managed when feasible. However, a life-saving transplant should not be delayed for nonurgent dental treatment. For high-MELD or high-bleeding-risk patients, elective dental procedures may be deferred until after transplantation. In this context, implant placement should ordinarily be postponed, with exceptional consideration reserved for highly selected stable patients after transplant-team discussion (DOVE et al., 2026).

The post-transplant evidence is more favorable, but it is also highly selected. Paredes et al. provide the strongest liver-specific comparative evidence among the cited studies, whereas Gu and Yu provide supportive case-series evidence and



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

Heckmann provides a single-patient longitudinal observation. Chen et al. broaden the evidence base across solid-organ transplantation but cannot be interpreted as liver-specific. These studies support feasibility rather than a universal guarantee of safety (PAREDES et al., 2018; GU; YU, 2011; HECKMANN et al., 2004; CHEN; TANG; LIAO, 2025).

The early post-transplant period deserves special attention. Although no implant-specific universal waiting interval exists, the first approximately three months generally represents a period of intensive immunosuppression and graft instability, making elective implant surgery inappropriate in most cases. Once the graft and systemic condition are stable, the transplant team can determine whether elective invasive dental care is appropriate. Immunosuppression itself should not be treated as the sole reason to deny implant therapy (NIDCR, 2022; PAREDES et al., 2018; DOVE et al., 2026).

Pharmacological management should similarly be conservative and evidence-based. In cirrhosis, acetaminophen up to 2 g/day is generally the preferred systemic analgesic when clinically appropriate, whereas systemic NSAIDs should generally be avoided. Transplant recipients require additional attention to interactions with immunosuppressants. Local anesthetic recommendations should remain principle-based rather than presenting unsupported universal dose reductions (ROGAL et al., 2022; CANCINO; LAZO; FONSECA, 2023; PAREDES et al., 2018).

Finally, the evidence base itself limits the strength of the recommendations. The direct literature is small, heterogeneous, and concentrated in selected transplant recipients. Evidence in non-transplanted cirrhosis is particularly limited, and long-term peri-implant disease may be more informative than early surgical feasibility alone. Prospective multicenter studies should separately evaluate early implant failure, survival, peri-implant mucositis/peri-implantitis, marginal bone loss, surgical complications, and patient-reported outcomes, while accounting for disease severity, portal hypertension, renal function, nutrition, periodontal status, and maintenance adherence (COSTA et al., 2022; PAREDES et al., 2018; CHEN; TANG; LIAO, 2025).

## CONCLUSION

Chronic liver disease should be regarded as a modifier of dental implant treatment risk rather than an automatic contraindication. The decision to proceed should be based on the patient's current systemic condition and the specific procedure proposed, not on the hepatic diagnosis or INR alone

Stable compensated patients may be considered for implant rehabilitation after assessment of disease severity, systemic reserve, hemostatic and renal status, oral



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

health, medications, and surgical complexity. Active hepatic decompensation should generally lead to postponement of elective implant placement until stabilization.

Before liver transplantation, dental care should prioritize infection control and should not delay a life-saving transplant. Elective implant therapy should ordinarily be deferred, with exceptional consideration only in highly selected stable patients after transplant-team discussion. After transplantation, implant therapy may be considered in medically and graft-stable recipients. No universal implant-specific waiting period exists, but the early post-transplant period is generally unsuitable for elective implant surgery.

Long-term peri-implant maintenance is an important component of care because cirrhosis has been associated with higher odds of peri-implantitis among patients with established implants. Overall, the available evidence supports feasibility in selected patients while underscoring substantial uncertainty, the need for multidisciplinary assessment, and the importance of matching procedural complexity to systemic reserve.

## REFERENCES

BIe, M.; WU, P.; ZHOU, J.; LI, Y.; ZHAO, L. Periodontal health status in cirrhotic patients: a systematic review and meta-analysis. BMC Oral Health, v. 23, p. 362, 2023. DOI: 10.1186/s12903-023-03052-5.

CANCINO, J.; LAZO, S.; FONSECA, D. Stomatological management of patients with liver disease: a review of the literature. Revista Científica Odontológica, 2023. DOI: 10.21142/2523-2754-1102-2023-153.

CHEN, Y.; TANG, L.; LIAO, C. Dental implants in solid organ transplant recipients: a systematic review and meta-analysis. Journal of Stomatology, Oral and Maxillofacial Surgery, v. 126, n. 4S, p. 102278, 2025. DOI: 10.1016/j.jormas.2025.102278.

COSTA, F. O.; CORTELLI, S. C.; CORTELLI, J. R.; LAGES, E. J. P.; PEREIRA, G. H. M.; COSTA, A. M.; COTA, L. O. M. Association between liver cirrhosis and peri-implant diseases: a case-control study on implant- and patient-related risk factors. Clinical Oral Investigations, v. 26, p. 3563-3572, 2022. DOI: 10.1007/s00784-021-04324-6.

DANFORD, C. J.; TRIVEDI, H. D.; BONDER, A. Bone health in patients with liver diseases. Journal of Clinical Densitometry, v. 23, p. 212-222, 2020. DOI: 10.1016/j.jocd.2019.01.004.

DOVE, L.; CHADHA, R. M.; LAI, J. C. et al. AASLD AST Practice Guideline on adult liver transplantation: Candidate evaluation. Hepatology, v. 83, n. 6, p. 1609-1645, 2026. DOI: 10.1097/HEP.0000000000001644.



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ISSN 2178-6925

**Received:** 13/08/2026 - **Accepted:** 08/09/2026
**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

EFEOĞLU, C.; SİPAHİ ÇALIŞ, A.; KARASU, Z.; KOCA, H.; BOYACIOĞLU, H. Prospective randomized single-blind study of post-operative bleeding after minor oral surgery in patients with cirrhosis. Turkish Journal of Gastroenterology, 2018. DOI: 10.5152/tjg.2018.18078.

FIRRIOLO, F. J. Dental management of patients with end-stage liver disease. Dental Clinics of North America, v. 50, p. 563-590, 2006. DOI: 10.1016/j.cden.2006.06.007.

GU, L.; YU, Y. C. Clinical outcome of dental implants placed in liver transplant recipients after 3 years: a case series. Transplantation Proceedings, v. 43, p. 2678-2682, 2011. DOI: 10.1016/j.transproceed.2011.06.037.

GUAÑABENS, N.; PARÉS, A. Osteoporosis in chronic liver disease. Liver International, v. 38, p. 776-785, 2018. DOI: 10.1111/liv.13730.

HECKMANN, S. M.; HECKMANN, J. G.; LINKE, J. J.; HOHENBERGER, W.; MOMBELLI, A. Implant therapy following liver transplantation: clinical and microbiological results after 10 years. Journal of Periodontology, v. 75, p. 909-913, 2004. DOI: 10.1902/jop.2004.75.6.909.

MEDINA, J. B.; ANDRADE, N. S.; DE PAULA EDUARDO, F. et al. Bleeding during and after dental extractions in patients with liver cirrhosis. International Journal of Oral and Maxillofacial Surgery, v. 47, p. 1543-1549, 2018. DOI: 10.1016/j.ijom.2018.04.007.

NATIONAL INSTITUTE OF DENTAL AND CRANIOFACIAL RESEARCH (NIDCR). Organ or Stem Cell Transplant and Your Mouth. Bethesda: National Institutes of Health, 2022.

NORTHUP, P. G.; FRIEDMAN, L. S.; KAMATH, P. S. AGA Clinical Practice Update on Surgical Risk Assessment and Perioperative Management in Cirrhosis: Expert Review. Clinical Gastroenterology and Hepatology, v. 17, p. 595-606, 2019. DOI: 10.1016/j.cgh.2018.09.043.

NORTHUP, P. G. et al. Vascular Liver Disorders, Portal Vein Thrombosis, and Procedural Bleeding in Patients With Liver Disease: 2020 Practice Guidance by the American Association for the Study of Liver Diseases. Hepatology, 2021. DOI: 10.1002/hep.31646.

PAREDES, V.; LÓPEZ-PINTOR, R. M.; TORRES, J.; DE VICENTE, J. C.; SANZ, M.; HERNÁNDEZ, G. Implant treatment in pharmacologically immunosuppressed liver transplant patients: a prospective-controlled study. Clinical Oral Implants Research, v. 29, p. 28-35, 2018. DOI: 10.1111/clr.13035.

RECH, B. O.; TENÓRIO, J. R.; FRANCO, J. B. et al. Risk of bleeding during oral surgery in patients with liver cirrhosis: a systematic review. The Journal of the American Dental Association, v. 152, p. 46-54.e2, 2021. DOI: 10.1016/j.adaj.2020.09.018.

ROGAL, S. S. et al. AASLD Practice Guidance: Palliative care and symptom-based management in decompensated cirrhosis. Hepatology, 2022. DOI: 10.1002/hep.32378.



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**Vol**: 13.19
**DOI**: 10.66104/rz6y5r28
**Pages:** 1-21

SHIRINEZHAD, A. et al. Prevalent osteoporosis and fracture risk in patients with hepatic cirrhosis: a systematic review and meta-analysis. BMC Gastroenterology, 2025. DOI: 10.1186/s12876-025-03720-6.

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