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Liver Transplant for Mesenchymal Hamartoma

Mesenchymal hamartoma of the liver (MHL) is a rare, benign tumor that primarily affects infants and young children, though it has been increasingly documented in adults. Surgical resection remains the treatment of choice; however, when tumors are deemed unresectable—due to size, anatomical constraints, recurrence, or risk of malignant transformation—liver transplantation (LT) becomes a necessary, life-saving alternative. Drawing from several clinical cases and institutional experiences, liver transplantation for MHL, though uncommon, has proven to be both feasible and curative in selected patients.

MHL typically presents in children under two years of age, manifesting as large, cystic hepatic masses. These lesions may cause abdominal distension, respiratory compromise, and gastrointestinal symptoms due to mass effect. Although benign, their presentation can closely mimic malignant liver tumors, particularly hepatoblastoma. In many cases, elevated serum alpha-fetoprotein (AFP) levels help distinguish hepatoblastoma from MHL, as AFP is often significantly elevated in malignancy and only mildly elevated or normal in MHL. Unfortunately, in practice, AFP testing is not always performed preoperatively, leading to diagnostic ambiguity.

One such diagnostic challenge was illustrated in a pediatric case where a 13-month-old boy was initially diagnosed with hepatoblastoma based on imaging and biopsy. Planned chemotherapy was delayed, and surgical resection was carried out instead. Postoperative histology confirmed mesenchymal hamartoma. This case highlighted the critical diagnostic role of serum AFP, which, if measured, might have led to an accurate preoperative diagnosis and avoided unnecessary oncologic interventions.

While resection is curative for most patients with MHL, certain presentations defy surgical removal. In these situations, LT becomes the definitive treatment. A pivotal pediatric case involved a child with Beckwith–Wiedemann Syndrome (BWS), a genetic overgrowth disorder associated with tumor development. The child developed six large mesenchymal hamartomas dispersed throughout the liver, causing significant abdominal mass effect. Resection was not possible due to the number and distribution of lesions. The child underwent successful cadaveric liver transplantation at 25 months of age. At 16-month follow-up, the patient showed no signs of tumor recurrence or graft rejection, marking a successful long-term outcome.

Another institutional review of pediatric liver transplantations included ten children transplanted for primary hepatic tumors, one of whom had MHL. In this case, the patient initially underwent attempted resection. However, the lesion’s rapid growth and anatomical

complexity necessitated liver transplantation. Although the patient required re-transplantation due to hepatic artery thrombosis four days postoperatively, they ultimately recovered fully. At follow-up, all patients, including the one with MHL, were alive with no evidence of tumor recurrence.

Adult cases of MHL are exceedingly rare but clinically significant due to their potential for massive growth and misdiagnosis. One notable case involved a 34-year-old woman who presented with a 21 kg liver mass that occupied nearly the entire abdominal cavity. Imaging revealed diffuse cystic disease of the liver, displacing other abdominal organs. Standard resection was impossible due to the sheer size and extent of the mass. Orthotopic liver transplantation was performed using a graft from a cardiac-death donor. The postoperative course was uneventful, and one year later, the patient remained healthy and tumor-free.

Another adult patient, aged 46, had previously undergone a right hepatectomy for a large MHL. Despite histologically confirmed clear margins, she presented 2.5 years later with recurrent disease. Imaging suggested extensive recurrence with possible malignant transformation. The lesions were deemed unresectable, and the patient underwent orthotopic liver transplantation. Pathological examination confirmed recurrent but benign MHL. Six months post-transplant, the patient showed no signs of disease or complications. This case is reportedly the first in the English literature to document liver transplantation for recurrent MHL.

A younger adult patient, 26 years old, was admitted with a massive hepatic mass occupying the right lobe. Imaging and biopsy suggested MHL, and surgical planning ruled out the need for transplantation due to a sufficient future liver remnant. A successful right hemi-hepatectomy was performed. The excised tumor weighed 8 kg and measured 35 cm. Histology confirmed MHL, and the patient was followed for 42 months with no signs of recurrence. However, the case reinforced the concern that giant MHLs carry a risk for recurrence and potential transformation, prompting discussion about the possible role of LT in similarly borderline cases.

The histological hallmark of MHL includes loose myxoid stroma, spindle cells, bile ducts, and islands of immature hepatocytes. Immunohistochemistry typically reveals positivity for desmin and smooth muscle actin in the stromal component, and cytokeratin 7 in the bile duct elements. In some cases, cytogenetic analysis has detected chromosomal abnormalities, such as loss of 19q13, raising concerns about malignant potential and supporting the rationale for aggressive surgical or transplant-based treatment in selected patients.

Surgical techniques for transplantation in these patients generally follow standard orthotopic liver transplant protocols. Some institutions favor the piggyback technique, especially in pediatric cases where anatomical variation and vessel size pose technical challenges. Immunosuppression typically involves tacrolimus-based therapy, often initiated with corticosteroids, and followed by maintenance with mycophenolate mofetil or mTOR

inhibitors. The latter are sometimes chosen in cases with oncologic concerns due to their antiproliferative properties.

Outcomes across the reviewed cases were uniformly positive. All transplanted patients survived the perioperative period and showed no recurrence at follow-up ranging from six months to three years. The primary complications included hepatic artery thrombosis and biliary strictures, both manageable with current surgical and interventional approaches. Importantly, none of the transplanted MHL cases demonstrated histologic evidence of malignant transformation, although the risk remains theoretical and justifies the aggressive treatment approach.

Taken together, these cases illustrate a consistent narrative: MHL, while benign, can behave in clinically aggressive ways. Massive growth, risk of rupture, recurrence, and the small but real potential for malignant transformation make management challenging, particularly when tumors are unresectable. Liver transplantation has proven to be a definitive solution in these rare but high-stakes scenarios. The decision to proceed with LT should be made in high-volume centers with experience in hepatobiliary surgery and transplantation, ideally supported by multidisciplinary tumor boards.

Moreover, these cases point to a diagnostic gap: the frequent initial misclassification of MHL as malignant disease. This has significant implications for treatment planning and highlights the need for a cautious, comprehensive diagnostic approach that includes serum AFP, advanced imaging, and, where possible, confirmatory histology with immunohistochemical profiling.

The role of surveillance post-resection also emerges as a key issue. While historically considered unnecessary for benign tumors, the recurrence of MHL in a resected adult patient suggests that regular follow-up imaging may be prudent, especially when resection margins are narrow or when tumors exhibit atypical features.

In conclusion, liver transplantation offers a safe and effective treatment for mesenchymal hamartoma of the liver when surgical resection is not feasible. The excellent survival and absence of recurrence across reported cases underscore its role as a curative option. As diagnostic tools improve and long-term data accumulate, LT may become more widely accepted for MHL in select pediatric and adult patients, particularly those with complex, recurrent, or high-risk presentations.

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Pediatric Interfacility Transfer in Suspected Appendicitis

Pediatric interfacility transfers are increasingly common in the United States, driven by the centralization of specialized pediatric services and the growing reliance on tertiary care hospitals for advanced diagnostic and surgical interventions. Among the many clinical indications prompting such transfers, suspected appendicitis represents a condition that illustrates both the potential benefit and the unintended consequences of regionalization.

Over the past two decades, research has documented a significant shift in where and how children with acute surgical conditions—including appendicitis—receive care. Analysis of state and national databases has revealed that more than 30% of pediatric transfers for abdominal pain or suspected appendicitis result in no surgical or imaging intervention at the receiving hospital. These “non-intervention” cases often indicate that the transfer may have been avoidable, raising serious concerns about resource use, patient safety, and healthcare equity.

At the same time, advances in diagnostic criteria, improved access to telehealth consultations, and the refinement of hospital capabilities metrics—such as the Pediatric Hospital Capability Index—offer opportunities to reduce unnecessary transfers while maintaining high-quality care.

Appendicitis remains one of the most common surgical emergencies in children. However, its presentation can be subtle or atypical, particularly in younger children. Typical symptoms—fever, migratory right lower quadrant pain, anorexia, and vomiting—are not always present, especially in early stages or among preschool-aged patients. Diagnostic uncertainty at community hospitals often prompts transfer, particularly when pediatric imaging, surgical consults, or pediatric-trained emergency physicians are not available.

However, not all transfers are necessary. A 2024 study from Children’s Hospital Los Angeles found that nearly 29% of transfers for suspected appendicitis did not result in appendectomy, suggesting the initial diagnosis was either incorrect or managed non-operatively. These patients were often younger, presented with milder symptoms, and had lower inflammatory markers such as WBC count, CRP, and neutrophil percentage.

Avoidable transfers have distinct characteristics:

- Younger age (median 9 vs. 11 years)
- Shorter duration of symptoms
- Atypical symptom presentation
- Lower serum inflammatory markers
- Normal or indeterminate imaging
- High likelihood of repeat imaging at the receiving center

In contrast, appropriate transfers more often result in appendectomy and tend to show clear clinical and laboratory evidence of acute appendicitis. Transfers for such cases are both medically justified and outcome-improving.

These findings reinforce the critical role of initial diagnostic accuracy and clinical judgment in deciding when to transfer.

Do's and Don'ts in Pediatric Interfacility Transfer for Suspected Appendicitis

DO:

- Use structured communication protocols. Verbal handoffs should follow a standardized format. The I-PASS tool, while primarily used in intra-hospital settings, has shown promise in improving interfacility handoffs by including critical elements such as illness severity, action lists, and contingency plans.
- Provide complete and clear documentation. Referral notes should include symptom chronology, physical exam findings, imaging results (preferably with digital copies), lab values, and reasoning for suspected diagnosis.
- Consult pediatric surgical specialists remotely before initiating a transfer, especially for borderline or atypical presentations. Telehealth consultations can prevent unnecessary patient movement.
- Assess pediatric readiness of the referring facility. Facilities with higher pediatric readiness scores are statistically less likely to transfer non-injured children unnecessarily. Boosting local readiness (e.g., staff training, pediatric coordinators, access to ultrasound) could mitigate the need for transfer.
- Evaluate socioeconomic and geographic impact. Understand that transfers often mean lost workdays, long travel, and financial hardship for families—especially those from rural communities.

DON'T:

- Don’t transfer solely due to lack of immediate imaging. Many cases can be triaged with observation, serial exams, and tele-radiology input.
- Don’t rely on ultrasound alone without context. A non-diagnostic ultrasound, especially when labs and clinical findings are normal, does not justify urgent transfer in most cases.
- Don’t skip communication between transferring and receiving physicians. Referring clinicians often fail to explicitly discuss illness severity or working diagnosis, while receiving physicians rarely summarize information back, increasing the risk of miscommunication.
- Don’t treat all abdominal pain as surgical until proven otherwise. This defensive posture can lead to over-transfer, especially in hospitals with no surgical services. Risk stratification should be nuanced, not reactive.

Inadequate pediatric resources at community hospitals—such as absence of on-call pediatric surgeons or low-volume emergency departments—drive much of the transfer volume. Facilities with low pediatric patient volumes are significantly less likely to have written transfer guidelines or agreements, increasing variability and risk in decision-making.

Implementation of formal interfacility transfer agreements and pediatric-specific protocols improves safety and standardizes expectations. National data shows that hospitals with pediatric emergency care coordinators and defined transfer policies perform better on safety and quality metrics.

Further, providers at non-specialty centers often report lacking confidence or training in pediatric surgical triage. In one national survey, the majority of referring providers were general emergency physicians without pediatric specialization, frequently citing the lack of inpatient beds or surgical backup as the main reason for transfer—even when clinical severity did not require it.

While interfacility transfer remains a critical part of pediatric emergency care, especially for surgical emergencies like appendicitis, it must be guided by clinical criteria, diagnostic clarity, and communication excellence. Avoidable transfers impose unnecessary burdens on families and the healthcare system. By applying evidence-based decision-making, fostering teleconsultative support, and strengthening pediatric readiness in community settings, we can reduce unnecessary transfers without compromising care.

The data strongly suggest that a collaborative, stratified approach to suspected pediatric appendicitis—rather than a reflexive transfer policy—can lead to better outcomes, lower costs, and improved patient satisfaction. Standardized communication, thoughtful risk assessment, and investment in local pediatric capability are the cornerstones of this transformation.

Given the complex clinical and legal implications of accepting transferred pediatric

patients—especially in cases of suspected appendicitis—it is essential that receiving institutions ensure appropriate medical liability coverage for their on-call surgical staff. Surgeons who assume care of transferred patients inherit full responsibility for diagnosis, treatment decisions, and outcomes, often without access to complete prior records or standardized communication from the referring site. Without institutional malpractice coverage, this creates an unfair exposure to legal risk and may discourage providers from accepting transfers. To safeguard patient access to timely care, reduce institutional liability, and support clinical decision-making in high-risk scenarios, hospitals must offer institutional medico-legal protection for surgeons receiving pediatric transfers.

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Vaping in Adolescents

Vaping among adolescents has evolved into a significant global public health concern, driven by rapid technological innovation, aggressive marketing, and widespread misconceptions about its safety. Initially introduced as a smoking cessation aid for adult smokers, vaping products—also known as electronic nicotine delivery systems (ENDS)—have instead found a substantial and growing user base among youth. The implications of this trend are far-reaching, spanning neurodevelopmental harm, respiratory diseases, addiction, and broader behavioral and societal impacts.

At the core of vaping's appeal to adolescents is its slick, modern design, and availability in an array of enticing flavors, from fruit and candy to mint and dessert profiles. These devices are often sleek, concealable, and even resemble everyday items like USB drives, making them easy to hide from adults. The perception that vaping is less harmful than traditional cigarettes has further fueled its popularity among teenagers, despite mounting evidence to the contrary.

Nicotine exposure during adolescence has been consistently associated with adverse effects on the developing brain. The adolescent brain undergoes significant growth and reorganization, particularly in areas related to attention, decision-making, and emotional regulation. Nicotine disrupts this maturation process, leading to long-term cognitive and behavioral impairments. Youth who vape are more likely to experience attention deficits, mood disorders, and reduced academic performance. Moreover, early nicotine exposure increases susceptibility to future addiction—not only to nicotine but to other substances, including alcohol, cannabis, and stimulants.

The addictive potential of vaping devices is intensified by the high concentrations of nicotine in many e-liquids, especially those using nicotine salts. Some pods contain as much nicotine as an entire pack of cigarettes, and adolescents may unknowingly consume large amounts in a short period due to the absence of harsh smoke and the smoothness of inhalation. The result is rapid onset of dependency, marked by strong cravings, withdrawal symptoms, and tolerance, even among those who previously had no history of tobacco use.

Health risks extend beyond neurodevelopment. The aerosol inhaled through vaping is not just “harmless water vapor” as often advertised; it contains a cocktail of chemicals, including propylene glycol, glycerin, flavoring agents, and heavy metals like nickel and lead. These substances can cause significant damage to lung tissue, leading to chronic respiratory conditions such as bronchitis, asthma exacerbations, and decreased lung function. Acute lung injuries linked to vaping—collectively referred to as EVALI (e-cigarette or vaping-associated lung injury)—have been reported in thousands of cases, some requiring hospitalization and mechanical ventilation.

The pathophysiology of EVALI is complex. It often involves a severe inflammatory response within the lungs, leading to conditions such as acute eosinophilic pneumonia or organizing pneumonia. While the exact agents responsible are still under investigation, vitamin E acetate has been implicated in many THC-containing products. However, nicotine-only products have also been associated with lung injuries, underscoring the risk inherent in a wide range of vaping substances.

Secondhand exposure presents additional concern. Aerosols released into the air by vapers contain ultrafine particles, volatile organic compounds, and nicotine, all of which can be inhaled by bystanders. This passive exposure is especially troubling in indoor environments such as homes, cars, or schools, where children and non-smoking peers may be involuntarily affected.

Social and behavioral factors contribute to the proliferation of vaping among adolescents. Peer influence, social media exposure, and celebrity endorsements glamorize vaping and normalize its use. Adolescents report vaping out of curiosity, for the “buzz,” or as a social activity. Alarmingly, many youth who initiate vaping have never smoked a traditional cigarette, indicating that vaping is not replacing smoking in this population—it is creating a new cohort of nicotine users.

Longitudinal data reveal that adolescents who vape are significantly more likely to transition to traditional cigarettes and cannabis products later in life. This gateway effect challenges the narrative that vaping is a harm reduction tool. Instead, it functions as an on-ramp to broader substance use and risky behaviors. The dual use of vaping and smoking is particularly concerning, as it exposes individuals to compounded health risks.

The cardiopulmonary implications of vaping are also under increasing scrutiny. Nicotine elevates heart rate and blood pressure by stimulating the sympathetic nervous system, and chronic exposure can lead to vascular remodeling and increased risk of heart disease. Other aerosol constituents, such as diacetyl and 2,3-pentanedione, are linked to bronchiolitis obliterans (“popcorn lung”), a debilitating and irreversible lung condition. Moreover, flavoring chemicals and solvents used in e-liquids can generate reactive aldehydes during heating, contributing to oxidative stress, endothelial dysfunction, and tissue damage.

Despite these risks, regulation has often lagged behind the market. In many countries, laws aimed at restricting youth access to vaping products have only recently been introduced or are inconsistently enforced. Flavored e-liquids remain widely available, and marketing strategies continue to target youth, directly or indirectly. Regulatory loopholes allow manufacturers to introduce new formulations or devices that evade existing restrictions.

Public health organizations globally have taken varying stances. While some, such as Public Health England, have promoted vaping as a harm reduction strategy for adult smokers, others—like the World Health Organization and numerous pediatric associations—have emphasized the potential for harm among youth and have called for tighter restrictions. The tension between supporting adult cessation and preventing youth uptake is a major challenge for policy-making.

Effective interventions must target multiple levels. Educational campaigns that debunk myths about vaping safety and highlight its risks are critical. Clinicians should be proactive in screening adolescents for vaping behaviors and providing support for cessation. School-based programs and peer-led initiatives can foster environments that discourage use. Parental involvement is also essential; many parents remain unaware of the signs of vaping or the risks it poses.

Moreover, there is a need for the development of youth-focused cessation tools. Most current cessation programs are designed for adults and may not resonate with adolescents. Mobile apps, counseling, and behavioral therapies tailored to younger users show promise, but require further investment and research.

In conclusion, vaping among adolescents is a complex and escalating public health issue. While initially presented as a less harmful alternative for adult smokers, its widespread use among youth has introduced new avenues for addiction and disease. The risks to brain development, respiratory health, and behavioral outcomes are well-documented and growing. To address this crisis, a coordinated response involving policy, education, clinical

practice, and community engagement is essential. Failure to act decisively risks normalizing nicotine use for a new generation and reversing decades of progress in tobacco control.

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