TIBBIYOT
TA'LIMI & INNOVATSIYALARI

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- 14.00.01 - Akusherlik va ginekologiya;
- 14.00.02 - Morfologiya;
- 14.00.03 - Endokrinologiya;
- 14.00.04 - Otorinolaringologiya;
- 14.00.05 - Ichki kasalliklar;
- 14.00.06 - Kardiologiya;
- 14.00.07 - Gigiena;
- 14.00.08 - Oftal'mologiya;
- 14.00.09 - Pediatriya;
- 14.00.10 - Yuqumli kasalliklar;
- 14.00.11 - Dermatologiya va venerologiya;
- 14.00.12 - Tibbiy reabilitologiya;
- 14.00.13 - Nevrologiya;
- 14.00.14 - Onkologiya;
- 14.00.15 - Patologik anatomiya;
- 14.00.16 - Normal va patologik fiziologiya;
- 14.00.17 - Farmakologiya va klinik farmakologiya;
- 14.00.18 - Psixiatriya va narkologiya;
- 14.00.19 - Klinik radiologiya;
- 14.00.20 - Tibbiy genetika;
- 14.00.21 - Stomatologiya;
- 14.00.22 - Travmatologiya va ortopediya;
- 14.00.23 - Hamshiralik ishini tashkil etish;
- 14.00.24 - Sud tibbiyoti;
- 14.00.27 - Xirurgiya;
- 14.00.28 - Neyroxirurgiya;
- 14.00.41 - Xalq tabobati;
- 14.00.35 - Bolalar xirurgiyasi;
- 14.00.34 - Yurak-qon tomir xirurgiyasi

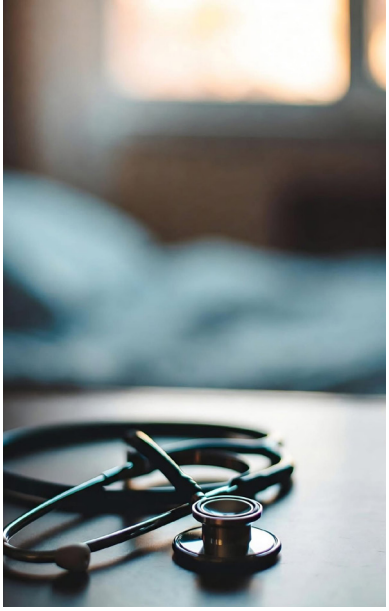
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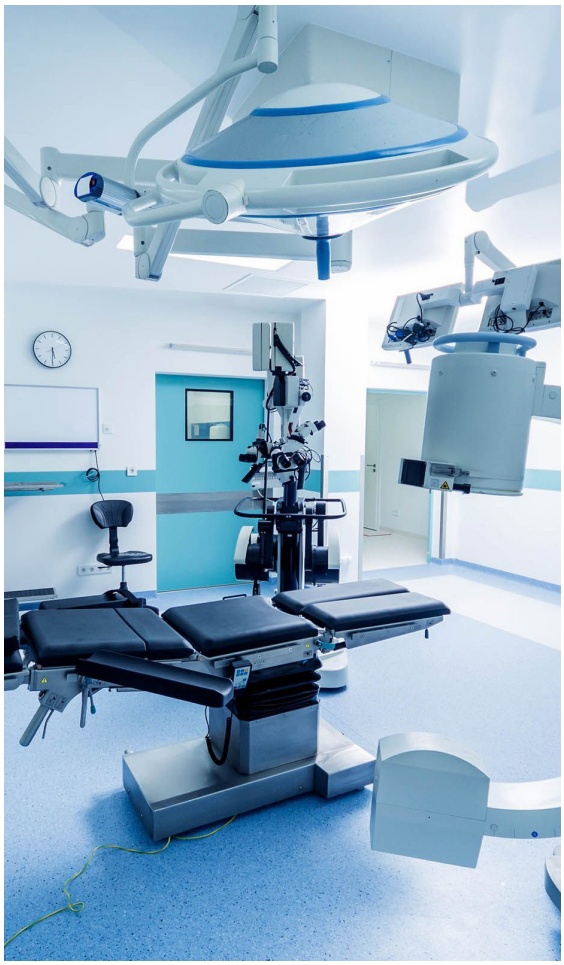
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MUNDARIJA

ОЦЕНКА РЕЗУЛЬТАТОВ КОМПЛЕКСНОГО ЛЕЧЕНИЯ ОСТЕОМИЕЛИТА ВЕРХНЕЙ ЧЕЛЮСТИ У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ 2 ТИПА 22
Махкамов Зохидхужа Хасанхон угли, Рузиматов Акмалбек Санжарбек угли, Аллаяров Абдулло Улугбек угли

ASSOCIATION OF VARICOCELE SEVERITY WITH SEMEN PARAMETERS IN INFERTILE MEN FROM THE FERGANA REGION: A CROSS-SECTIONAL STUDY 27
Egamberdiyev Dilmurod Kamolitdinovich, Mo‘mindjonov Mansurjon Murodovich, Bozorov Shakhzodbek Rustamovich, Ibrokhimov Diyorbek Valijonovich, Turdiboyev Abduqodir Obidovich

PROFILAKTIK TIBBIYOTNING ZAMONAVIY MUAMMOLARI VA RIVOJLANISH ISTIQBOLLARI 34
Madazizova Dilfuza Raxmatullayevna, Safarova Sanobar Omontashevna, Djumayeva Hikoyat Sharipovna

DISTONIYALI PUBERTAT DAVRIDAGI BOLALARDA PSIXOVEGETATIV BUZILISHLAR VA NEYROENDOKRIN FAOLLIKNING O‘ZARO BOG‘LIQLIGI 38
Abdulxakova Ra’noxon Muxtaraliyevna

ОПТИМИЗАЦИЯ ХИРУРГИЧЕСКОЙ ТАКТИКИ ПРИ ЛЕЧЕНИИ ПОСЛЕОЖОГОВОЙ РУБЦОВОЙ АЛОПЕЦИИ ВОЛОСИСТОЙ ЧАСТИ ГОЛОВЫ: СРАВНИТЕЛЬНАЯ ОЦЕНКА МЕТОДОВ ПЛАСТИКИ 43
Ташходжаев Жасур Комилжон угли

OVOZ BOYLAMLARI O‘SIMTASIMON KASALLIKLARINING MORFOLOGIK VA GISTOLOGIK XUSUSIYATLARI 49
Nasiba Shavkatovna Rasulova, Gavxar Saidaxmatovna Xaydarova

ATEROSKLEROTIK KARDIOSKLEROZDA MIOKARD MIKROSIRKULYATOR O‘ZANINING YOSHGA BOG‘LIQ REMODELLANISHI 58
Butayev Sherzod Fayzulloyevich, Jumanov Z. E., Pirmatov S. V.

METABOLIK SINDROMDA YURAKNING ERTA STRUKTURAVIY VA FUNKSIONAL O‘ZGARISHLARI: DIFFUZ MIOKARD FIBROZIDAN OTISH FRAKSIYASI SAQLANGAN YURAK YETISHMOVCHILIGIGACHA 62
Zikrillayev Farrux Abdurashitovich

SARATON BILAN OG‘RIGAN BEMORLARGA TIBBIY YORDAM KO‘RSATISHGA YONDASHUVNING UMUMIY TAMOYILLARI 70
Atabekov Sanjar Nurmatovich

EKSPERIMENTAL GIPEROKSIGENATSIYADA KALAMUSHLAR BUYRAK TO‘QIMASIDAGI MORFOLOGIK VA IMMUNOGISTOKIMYOVIY O‘ZGARISHLARNING KISLOROD KONSENTRATSIYASI VA TA’SIR DAVOMIYLIGIGA BOG‘LIQ DINAMIKASI 79
Namozov Elyorbek Ilhomovich

КРАНИОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ ЛИЦЕВОГО СКЕЛЕТА У БОЛЬНЫХ С ОДНОСТОРОННЕЙ СКВОЗНОЙ РАСЩЕЛИНОЙ ГУБЫ И НЁБА ПОСЛЕ ХЕЙЛО- И УРАНОПЛАСТИКИ В РАННЕМ И ПОЗДНЕМ СМЕННОМ ПРИКУСЕ 87
Муртазаев Саидиало Муртазаевич, Юлдашев Темурхон Акрамович, Муртазаев Саидазим Саидазамович

ARTIFICIAL INTELLIGENCE FOR ULTRASOUND ESTIMATION OF FETAL WEIGHT: OPPORTUNITIES, EVALUATION METRICS, AND COMPARISON WITH THE HADLOCK FORMULA 93
Dilnoz Botirovna Ibrohimova

ЭТИОЛОГИЯ, КЛИНИКО-НЕВРОЛОГИЧЕСКИЕ ОСОБЕННОСТИ И СОВРЕМЕННЫЕ ПОДХОДЫ К СОПРОВОЖДЕНИЮ ДЕТЕЙ С СИНДРОМОМ ДАУНА 98
Насирова Нодира Хапизовна

ЭНДОТОКСЕМИЯ И ЕЁ РОЛЬ В РАЗВИТИИ СИСТЕМНЫХ НАРУШЕНИЙ ПРИ ХРОНИЧЕСКОМ ПАРОДОНТИТЕ 107
Мадмаров Махмуд Маъруфович

PSORIAZ KASALLIGINING PATOGENEZI, ZAMONAVIY DIAGNOSTIKASI VA DAVOLASH USULLARI: KLINIK YONDASHUVLAR VA ISTIQBOLLAR 112
Yo‘ldosheva Dilnoza Saidazim qizi

MORPHOFUNCTIONAL CHANGES IN THE PROSTATE GLAND IN ENVIRONMENTALLY INDUCED UROLITHIASIS AND UNDER NORMAL CONDITIONS, AND THEIR BIOCORRECTION 116
Mansurov Sardor Vali ugli

ВЛИЯНИЕ ИНГИБИТОРОВ ПРОТОННОЙ ПОМПЫ НА РАЗВИТИЕ ОСТЕОПОРОЗА: ПАТОГЕНЕТИЧЕСКИЕ МЕХАНИЗМЫ, ФАКТОРЫ РИСКА И КЛИНИЧЕСКОЕ ЗНАЧЕНИЕ 123
Лутфуллаев Олтин Ойбек ўғли

BOLALARDA ATOPIK DERMATITNI DAVOLASHNING ZAMONAVIY USULI 129
G‘aniyev Abdurashid G‘aniyevich

MOLIYAVIY RAG‘BATLARNING SOG‘LIQNI SAQLASH XIZMATI SIFATIGA TA’SIRI 133
Kamolova Mohinur Iskandarovna, Obloyorova Ruxshona Inomjon qizi

INTEGRATING PREOPERATIVE AND INTRAOPERATIVE ASSESSMENT WITH THE HOLERIS SCORE IN ACUTE CALCULOUS CHOLECYSTITIS 137
Qurbanov Rustambek Rahimovich, Khamdamov Ilkhomjon Bakhtiyorovich, Raximov Ravshanbek Rustambek o‘g‘li

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INTEGRATING PREOPERATIVE AND INTRAOPERATIVE ASSESSMENT WITH THE HOLERIS SCORE IN ACUTE CALCULOUS CHOLECYSTITIS

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Abstract: Objective. To describe the structure, interrelationships among components, and discriminative performance of the HOLERIS perioperative score in acute calculous cholecystitis. Materials and methods. A descriptive secondary analysis was conducted using aggregated data from a cohort of 184 patients treated between 2020 and 2025. The cohort comprised 91 patients who received conventional care and 93 patients managed according to a differentiated strategy. HOLERIS incorporates four preoperative and six intraoperative criteria, each scored from 0 to 2, yielding a maximum total score of 20. Results. Impaired safe visualization demonstrated the highest reported adjusted odds ratio of 4.797 (95% CI: 2.34–9.84). The reported areas under the receiver operating characteristic (ROC) curve were 0.832 for the preoperative component, 0.861 for the Parkland score, 0.901 for the intraoperative component, and 0.947 for HOLERIS. The sensitivity and specificity of HOLERIS were 92.6% and 88.4%, respectively. Risk categories were defined as low risk (0–5 points), high risk (6–14 points), and critical risk (15–20 points). Conclusions. HOLERIS integrates anticipated operative difficulty with the anatomical conditions encountered during surgery. Its interpretation is perioperative in nature and depends on the stage of assessment and the definition of the composite outcome. Reliable anatomical identification remains essential for proceeding with the standard operative approach, regardless of the total score.

Key words: acute calculous cholecystitis; HOLERIS; perioperative score; prediction; discrimination; anatomical safety; laparoscopic cholecystectomy.

Annotatsiya: Maqsad. O‘tkir kalkulyoz xoletsistitda XOLERIS perioperatsion shkalasining tuzilishi, komponentlari o‘rtasidagi o‘zaro bog‘liqlik va diskriminatsion qobiliyatini tavsiflash. Materiallar va usullar. 2020–2025-yillarda davolangan 184 nafar bemordan iborat kohortaning umumlashtirilgan ma’lumotlari asosida tavsifiy ikkilamchi tahlil o‘tkazildi. Kohortaga standart davolash olgan 91 nafar bemor va differensial yondashuv asosida davolangan 93 nafar bemor kiritildi. XOLERIS shkalasi operatsiyadan oldingi to‘rtta va intraoperatsion oltita mezonni o‘z ichiga oladi. Har bir mezon 0–2

ball oralig‘ida baholanadi, maksimal umumiy ball esa 20 ni tashkil etadi. Natijalar. Xavfsiz vizualizatsiya sharoitlarining buzilishi uchun eng yuqori qayd etilgan tuzatilgan imkoniyatlar nisbati 4,797 (95% ishonch oralig‘i: 2,34–9,84) ni tashkil etdi. ROC egri chizig‘i ostidagi maydon (AUC) operatsiyadan oldingi komponent uchun 0,832, Parkland shkalasi uchun 0,861, intraoperatsion komponent uchun 0,901 va XOLERIS shkalasi uchun 0,947 ga teng bo‘ldi. XOLERIS shkalasining sezgirligi 92,6%, xosligi esa 88,4% ni tashkil etdi. Xavf toifalari quyidagicha belgilandi: past xavf — 0–5 ball, yuqori xavf — 6–14 ball va kritik xavf — 15–20 ball. Xulosa. XOLERIS shkalasi operatsiyaning kutilayotgan murakkabligini jarrohlik amaliyoti davomida aniqlanadigan anatomik sharoitlar bilan birlashtiradi. Shkala natijalarini talqin qilish perioperatsion xususiyatga ega bo‘lib, baholash bosqichi va tarkibli yakuniy natija mezonining ta’rifiga bog‘liq. Umumiy ball miqdoridan qat’i nazar, operatsiyani standart usulda davom ettirish uchun anatomik tuzilmalarning ishonchli identifikatsiyasi muhim shart bo‘lib qoladi.

Kalit so‘zlar: o‘tkir kalkulyoz xoletsistit; XOLERIS; perioperatsion shkala; prognozlash; diskriminatsion qobiliyat; anatomik xavfsizlik; laparoskopik xoletsistektomiya.

Аннотация: Цель. Охарактеризовать структуру, взаимосвязи компонентов и дискриминационную способность периоперационной шкалы ХОЛЕРИС при остром калькулезном холецистите. Материалы и методы. Проведен описательный вторичный анализ агрегированных данных когорты из 184 пациентов, проходивших лечение в 2020–2025 годах. В когорту вошли 91 пациент, получавший стандартное лечение, и 93 пациента, которым применялась дифференцированная тактика. Шкала ХОЛЕРИС включает четыре предоперационных и шесть интраоперационных критериев, каждый из которых оценивается от 0 до 2 баллов. Максимальная суммарная оценка составляет 20 баллов. Результаты. Наибольшее зарегистрированное скорректированное отношение шансов отмечено для нарушения условий безопасной визуализации и составило 4,797 (95% ДИ: 2,34–9,84). Площади под ROC-кривой составили 0,832 для предоперационного компонента, 0,861 для шкалы Parkland, 0,901 для интраоперационного компонента и 0,947 для шкалы ХОЛЕРИС. Чувствительность и специфичность шкалы ХОЛЕРИС составили 92,6% и 88,4% соответственно. Категории риска определены следующим образом: низкий риск — 0–5 баллов, высокий риск — 6–14 баллов, критический риск — 15–20 баллов. Заключение. Шкала ХОЛЕРИС объединяет ожидаемую сложность оперативного вмешательства с анатомическими условиями, выявляемыми непосредственно во время операции. Ее интерпретация носит периоперационный характер и зависит от этапа оценки и определения составной конечной точки. Надежная анатомическая идентификация остается обязательным условием продолжения операции стандартным способом независимо от суммарного количества баллов.

Ключевые слова: ХОЛЕРИС; острый калькулезный холецистит; периоперационная шкала; прогнозирование; дискриминационная способность; анатомическая безопасность; лапароскопическая холецистэктомия.

INTRODUCTION

Assessment during laparoscopic cholecystectomy evolves as additional information becomes available. Findings at admission characterize the severity of inflammation and anticipated local anatomical changes, whereas laparoscopy provides direct information about operative exposure, adhesions, and the anatomical relationships of the cystic structures. The transition between these assessment stages determines how risk stratification can inform operative planning and subsequent intraoperative decisions [1–4].

HOLERIS integrates clinical and ultrasonographic findings with intraoperative observations into a single perioperative score. Its structure links anticipated operative difficulty to the anatomical conditions encountered during dissection. The present analysis describes the contribution of individual components and the reported estimates of the discriminatory performance of the integrated scoring system.

The objective was to characterize the structure of HOLERIS, examine the reported associations of its ten criteria, and assess the relationship between its risk categories and differentiated surgical management in patients with acute calculous cholecystitis.

RESEARCH METHODOLOGY

The clinical cohort comprised 184 patients who underwent attempted laparoscopic cholecystectomy for acute calculous cholecystitis between 2020 and 2025. Treatment was provided at Ibn Sina City Clinical Hospital No. 1 in Tashkent, in collaboration with Bukhara State Medical Institute. Conventional management was applied to 91 patients during 2020–2022, whereas a differentiated management strategy was used in 93 patients during 2023–2025. The two cohorts represented consecutive calendar periods. A descriptive secondary analysis was conducted using the aggregate score definitions, multivariable association estimates, and discrimination measures reported in the clinical study. Associations between individual components and the outcome were summarized using the reported regression coefficients, adjusted odds ratios, and 95% confidence intervals.

Discriminatory performance was described using the reported areas under the receiver operating characteristic curve (AUC), sensitivity, and specificity. The composite adverse outcome included conversion to open surgery, subtotal or otherwise nonstandard completion of the procedure, and early or subsequent biliary complications. Conversion and subtotal completion reflect changes in the operative approach or extent of surgical intervention, whereas postoperative complications represent patient morbidity. This combination of outcomes determines the clinical interpretation of the reported associations and discrimination estimates.

The analysis distinguished between information available before incision and findings obtained during surgery. Four criteria were assigned to the preoperative assessment stage and six to the intraoperative stage. Consequently, the complete score represented the overall perioperative situation and could be calculated only after all required components had been assessed. Performance measures were compared descriptively according to the definitions used in the clinical study. AUC was used to characterize the ability to discriminate between patients with and without the composite adverse outcome, while sensitivity and specificity described the reported operating characteristics at the selected threshold. The low-, high-, and critical-risk categories were treated as ordinal score groups and examined in relation to the differentiated surgical management strategy.

ANALYSIS AND RESULTS

HOLERIS comprises ten criteria, with a total score ranging from 0 to 20 points. The preoperative domains include the condition of the gallbladder neck and Hartmann's pouch, gallbladder wall characteristics on ultrasonography, pericholecystic changes, and comorbidities. The intraoperative domains comprise safe visualization, operative exposure, adhesions, gallbladder bed findings, contamination, and intraoperative assessment of the gallbladder wall (Table 1). The preoperative component contributes a maximum of eight points, while the intraoperative component contributes up to twelve points. The overall score integrates the initial morphological assessment with findings obtained during surgery. This structure establishes HOLERIS as a perioperative assessment tool, while preserving the stage-specific clinical relevance of its individual components. The score defines three risk categories: low risk (0–5 points), high risk (6–14 points), and critical risk (15–20 points). These categories reflect the overall burden of recorded abnormalities. However, patients with scores near the lower and upper boundaries of the broad high-risk category may present substantially different combinations of the ten criteria. Therefore, interpretation of the individual component profile remains important alongside the total score.

Table 1. HOLERIS criteria and point categories

Domain	0 points	1 point	2 points
Neck and Hartmann pouch	Identifiable	Tense gallbladder or hydrops	Impacted stone or neck obstruction
Ultrasound wall status	<4 mm	4–6 mm with oedema or layering	>6 mm or marked destruction
Pericholecystic changes	Absent	Fluid or limited infiltration	Perforation, abscess or subhepatic infiltration
Comorbidity and technical burden	Absent	One factor	At least two factors
Safe visualization	Achievable	After additional measures	Unattainable
Exposure	Good	Limited	Unsatisfactory
Adhesions and pericholecystitis	Absent	Moderate pericholecystitis	Dense infiltration or adhesions
Gallbladder bed	Usual separation	Minor liver injury	Part of wall left in place
Contamination	Absent	Microperforation	Infected bile spillage
Operative wall status	Not tense	Tense	Gangrene or perforation

Although each domain contributes a defined maximum number of points to the scoring system, the reported regression coefficients vary between criteria. Safe visualization had a regression coefficient of 1.568, whereas comorbidity had a coefficient of 0.768. Thus, the additive point system provides an ordinal bedside assessment of the recorded criteria rather than directly reproducing the relative weights derived from the regression model. The component profile helps identify the source of operative difficulty. A greater contribution from ultrasonographic findings characterizes the anticipated local morphological complexity, whereas impaired operative exposure or safe visualization indicates difficulties encountered during the procedure. Considered together, these components provide a structured representation of the progression from preoperative assessment to the anatomical conditions observed intraoperatively.

Impaired safe visualization demonstrated the highest reported adjusted odds ratio (OR) of 4.797 (95% CI: 2.34–9.84). The corresponding ORs were 3.344 for operative exposure, 3.274 for the condition of the gallbladder neck and Hartmann's pouch, and 3.114 for adhesions and pericholecystitis. These associations highlight the contribution of operative orientation and local anatomical conditions to the composite outcome. Ultrasonographic gallbladder wall changes and pericholecystic abnormalities had reported adjusted ORs of 2.986 and 2.776, respectively. These associations link the preoperative characterization of local inflammation to the anatomical and operative conditions subsequently encountered during surgery. The corresponding domains complement findings obtained through direct laparoscopic visualization. The reported ORs for gallbladder bed findings, contamination, and intraoperative gallbladder wall status were 2.397, 2.273, and 2.195, respectively. Comorbidity and technical burden had a reported OR of 2.155. Collectively, the ten criteria encompass patient-related factors, local inflammatory morphology, and conditions arising during surgical dissection (Table 2). The intraoperative criteria also differ in the timing at which they become assessable. Operative exposure and adhesions can be evaluated during the initial intraoperative assessment, whereas gallbladder bed findings and contamination may become apparent at later stages of dissection. Accordingly, the timing of each observation is an important consideration when interpreting the integrated score. Deformity of the gallbladder neck, inadequate operative exposure, and impaired safe visualization may also represent interrelated manifestations of the same underlying anatomical difficulty.

Table 2. Reported multivariable associations of HOLERIS criteria

Domain	β	Odds ratio	95% CI
Safe visualization	1.568	4.797	2.34–9.84
Exposure	1.207	3.344	1.69–6.62
Neck and Hartmann pouch	1.186	3.274	1.72–6.24
Adhesions and pericholecystitis	1.136	3.114	1.55–6.25
Ultrasound wall status	1.094	2.986	1.58–5.64
Pericholecystic changes	1.021	2.776	1.44–5.35
Gallbladder bed	0.874	2.397	1.16–4.94
Contamination	0.821	2.273	1.08–4.78
Operative wall status	0.786	2.195	1.19–4.03
Comorbidity and technical burden	0.768	2.155	1.20–3.89

The reported areas under the receiver operating characteristic curve (AUCs) were 0.832 (95% CI: 0.756–0.908) for the preoperative component, 0.861 (95% CI: 0.795–0.927) for Parkland grading, 0.901 (95% CI: 0.848–0.954) for the intraoperative component, and 0.947 (95% CI: 0.912–0.982) for HOLERIS. The point estimates showed an increasing trend across assessments incorporating progressively more intraoperative information (Figure 1). This comparison reflects different stages of information acquisition. A preoperative assessment tool estimates the anticipated operative difficulty before incision [7], whereas an integrated perioperative score additionally incorporates anatomical findings identified during dissection. Previous studies evaluating the Nassar and Parkland systems have similarly distinguished between preoperative prediction and intraoperative grading [2,5,8,9,11]. The reported sensitivity was 79.4% for the preoperative component and 92.6% for HOLERIS, whereas specificity was 75.1% and 88.4%, respectively. The overall accuracy reported for HOLERIS was 90.5%. The complete set of AUC, sensitivity, and specificity estimates is presented in Table 3.

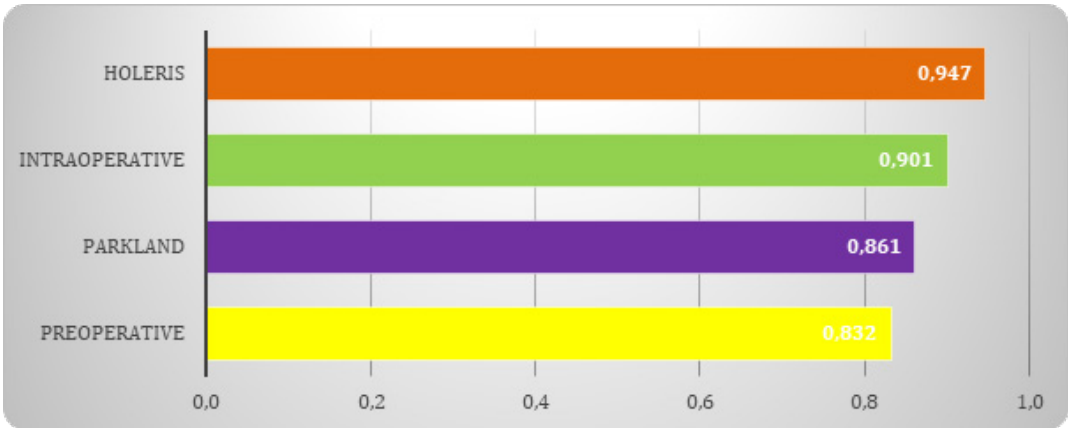


Figure 1. Reported AUC values for the four assessment systems.

Table 3. Reported discrimination and operating characteristics

System	AUC	Sensitivity %	Specificity %
Preoperative component	0.832	79.4	75.1
Parkland grading	0.861	82.7	78.9
Intraoperative component	0.901	86.8	83.2
HOLERIS	0.947	92.6	88.4

AUC — area under the receiver operating characteristic curve.

The integrated structure links the assigned risk category to the corresponding operative response. Low-risk cases were associated with standard completion of the procedure, provided that reliable anatomical identification was achieved. High-risk cases prompted additional measures to improve operative exposure, including gallbladder decompression, adjusted traction, and further anatomical assessment before division of the cystic structures. Critical-risk cases supported discontinuation of unsafe standard dissection and consideration of a protective alternative surgical approach [8,9]. The safe visualization criterion has clinical significance beyond its numerical contribution to the total score. An unsafe visualization finding contributes no more than two points and may therefore coexist mathematically with a low overall score when the remaining criteria are favourable. Nevertheless, reliable identification of the cystic duct and cystic artery remains an essential prerequisite for proceeding with standard dissection, irrespective of the total score or assigned risk category [4,6,10].

Reassessment following additional exposure measures should focus on the anatomical conditions achieved. Gallbladder decompression may facilitate grasping and traction, while modification of retraction can improve the operative field of view. These interventions are clinically meaningful when they provide clearer visualization of the anatomical relationships of the relevant structures. Persistent anatomical uncertainty remains a decisive consideration even when other components of the operative assessment improve. The score combines findings that differ in their timing of assessment and clinical implications within a concise scoring framework. Its practical value lies in linking the initial preoperative assessment with subsequent intraoperative reassessment. The total score reflects the overall burden of operative difficulty, whereas the component profile helps identify whether the immediate challenge relates to operative exposure, anatomical identification, gallbladder wall destruction, or contamination.

CONCLUSIONS

HOLERIS integrates four preoperative and six intraoperative criteria into a composite score ranging from 0 to 20 points. Impaired safe visualization demonstrated the largest reported adjusted association with the composite outcome, while the integrated scoring system achieved a reported AUC of 0.947. The score characterizes the combined contribution of anticipated operative difficulty and anatomical findings observed during surgery. Interpretation of the score depends on the assessment stage and the definition of the composite outcome. Individual criteria retain their clinical relevance alongside the total score. Reliable anatomical identification remains an essential prerequisite for proceeding with standard dissection, regardless of the assigned risk category.

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