Kaiser Permanente Division of Research
Delivery Science and Applied Research
2024 Community Health Benefit Grant Project:

Evaluating safety and efficacy of current imaging guidelines for gallbladder polyps

George Liao MD, Vacaville Surgery

Sundeep Nayak MD, Radiology, Regional Chair IMAGing Appropriateness Committee (IMAGAC)

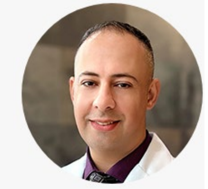
Eugene Chang MD, Surgery, Regional Chief of General Surgery

Richard Danialan DO, Pathology Consultant

Oliver Pang, Research Assistant, UC Davis Undergraduate

Supported by Data Reporting and Analytics Consultant **Deanna Fink**



Impetus

- Gallbladder polyps (GBP) have long been **associated** with Gallbladder Cancer (GBC)
- GBC is often diagnosed incidentally early by cholecystectomy or late when already metastatic.
- Surveillance and management of GBP subject of ongoing research
- 2020 Szpakowski & Tucker JAMA paper via *KP NCAL Community Benefit Program Grant*
  - **Large** study on GBP & GBC association, **20 yrs** ('95-'14), **622K members**, 26K GBP, 365 GBC
  - **GBP** found in **6% of GBC cohort** and **5.8% of 622K study members**
  - **GBC** incidence of **0.053% within GBP cohort** and **0.054% within non-GBP cohort**
  - Polyps 6-9mm, probability of growth of >2mm at 10 years 53%
  - **Conclusions:**
    - **GBC rates low and similar among patients with and without GBP**
    - **Should we be following GBP to detect GBC?**

Impetus

- KP NCAL IMAGing Appropriateness Committee (IMAGAC)
  - **Prior to 2020**
    - For gallbladder polyps 6-9mm, repeat ultrasound at **6 and 18 months**.
  - **Since 2020**
    - For gallbladder polyps 6-9mm, repeat ultrasound at **24 months**
- **Is new recommendation safe? Is it effective? Can we add to the current understanding of polyps and polyp risk to gallbladder cancer?**

Tag	Recommendation
#gb1	Per interregional practice parameter, gallbladder polyps **< 6 mm** require no additional surveillance. NOTE: Patients with primary sclerosing cholangitis and polyps of any size should be referred to surgery for further management
#gb2a	Gallbladder polyp(s) **6-9 mm require follow up at 2 years**. If polyp(s) less than 1 cm at follow-up, no additional surveillance is required. NOTE: Patients with primary sclerosing cholangitis and polyps of any size should be referred to surgery for further management.
#gb2b	Gallbladder polyp(s) 6-9mm with **less than 2 years** of follow-up. Recommend follow-up ultrasound in 2 years. NOTE: Patients with primary sclerosing cholangitis and polyps of any size should be referred to surgery for further management.
#gb2c	Gallbladder polyp(s) 6-9mm with **at least 2 years of follow-up**. No additional surveillance is required. NOTE: Patients with primary sclerosing cholangitis and polyps of any size should be referred to surgery for further management.
#gb3	Per interregional practice parameter, surgical consultation is recommended for gallbladder polyp(s) **>/=10 mm**.

Impetus

Cost of an ultrasound of the abdomen not trivial

- **Financial**
  - **CPT 76700** “Ultrasound, abdomen, complete”
    - Without insurance **$150-$700**
    - With insurance copay **$50-$100**
  - **CPT 76700** “Ultrasound of the abdomen, limited
    - **$28** (Medicare) to **$1365**
- **Physical**
  - **Workplace injury to sonographers**
  - **Work-Related Musculoskeletal Disorders (WRMSD)**

Google search. (2025). *Google Search*. (5/6/2025) https://www.google.com

Gallbladder Polypoid foci (GBPF)

CHOLESTEROL OR INFLAMMATORY POLYPOID FOCI

- 40 - 50 years, female, < 10 mm, multiple
- "Ball on the wall" sign, immobile, round or lobulated
- Hyperechogenic (or variable) adherent to wall
- Comet tail artifact
- No posterior acoustic shadowing

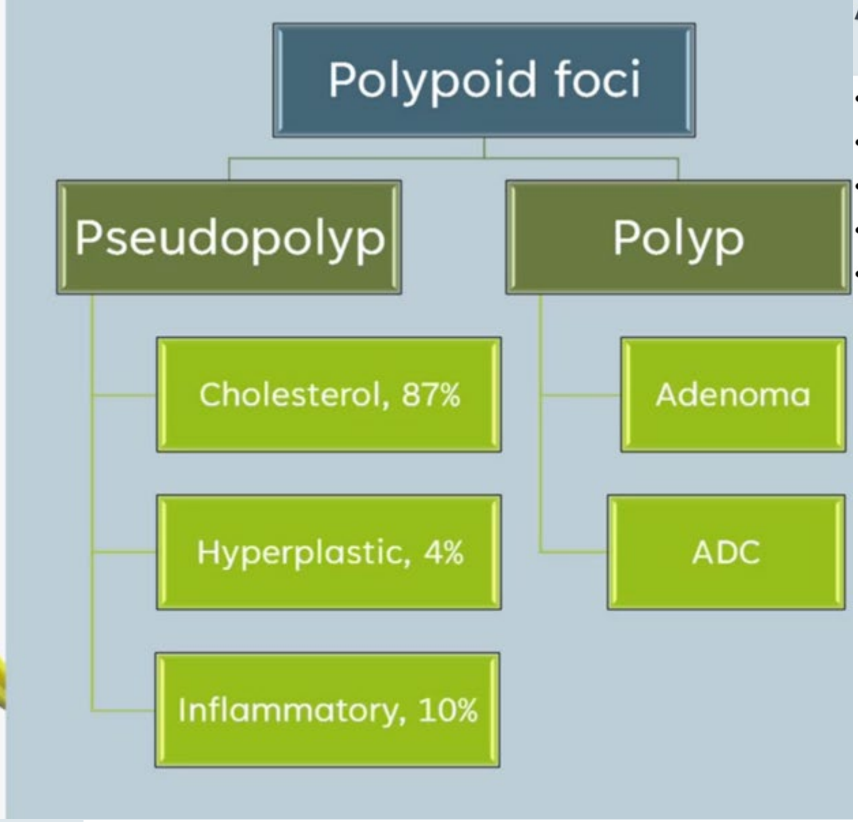
CHOLESTEROL DEPOSITION DISEASE

- **Luminal**: crystals precipitate in bile trapped in mural diverticula (RA sinuses) lined by mucosal epithelium = adenomyomatosis
- **Laminar**: triglycerides and cholesterol esters deposited within macrophages in lamina propria covered by mucosal epithelium = cholesterol polypoid foci

ADENOMYOMATOSIS

- Benign, non-inflammatory hyperplastic wall disorder
- Epithelial proliferation and hypertrophy causes mucosal outpouching (R-A sinuses) into thickened muscular wall
- Dehydration and inspissation of bile precipitates small cholesterol crystals causing chronic inflammation and dystrophic calcification

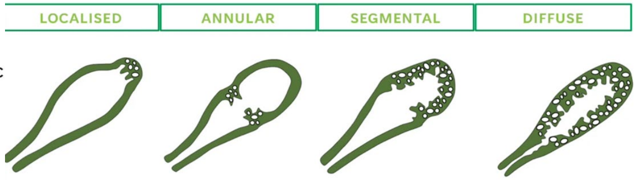
WHY POLYPOID FOCI



ADENOMYOMATOSIS

- 40 - 50 years, female, < 10 mm, 10% of US
- Multiple, immobile
- Selective mural thickening with small anechoic cystic spaces
- Comet tail reverberation artifact
- Could have posterior acoustic shadowing

ADENOMYOMATOSIS PHENOTYPES



ADENOMA

- 60 years, female, 5 – 20 mm
- Solitary
- Lobulated, immobile, hyperechogenic
- No posterior acoustic shadowing
- Internal vascularity on Doppler color imaging

Adenocarcinoma (ADC)

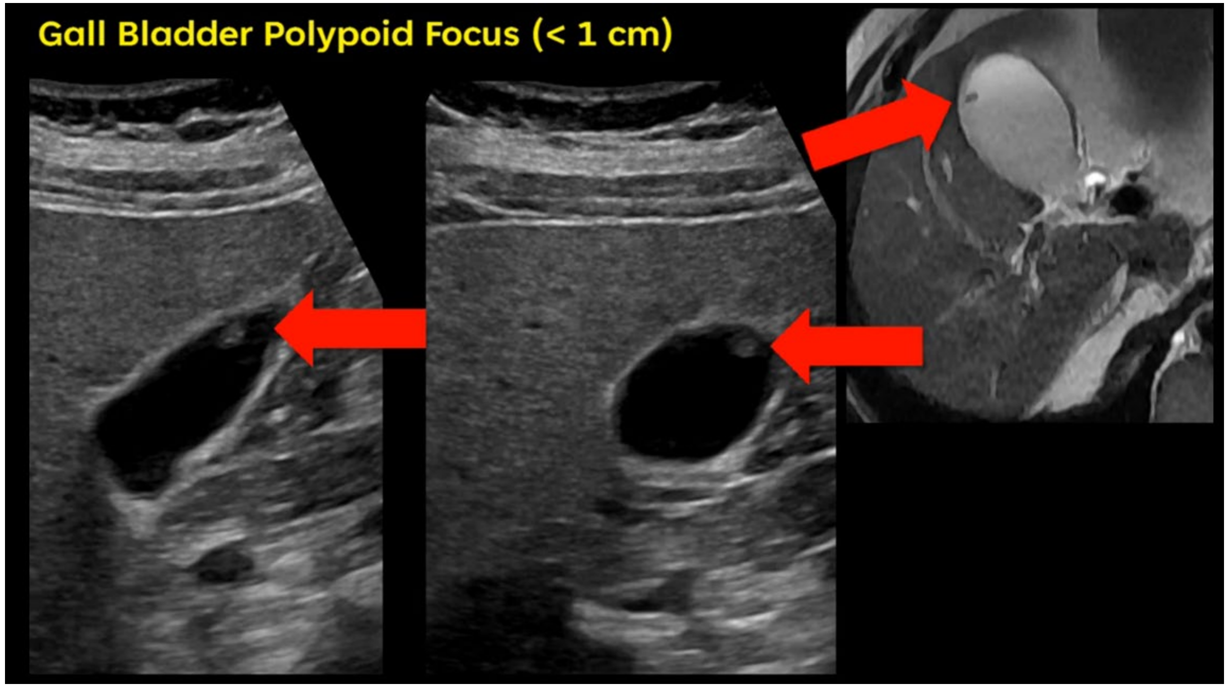
- >60yo (moderate quality)
- **Unclear how many gallbladder cancers are preceded by a GBPF**
- **>95% with concomitant gallstones**
- **0.15% of cholecystectomy specimens**
- **7% of GBPF**

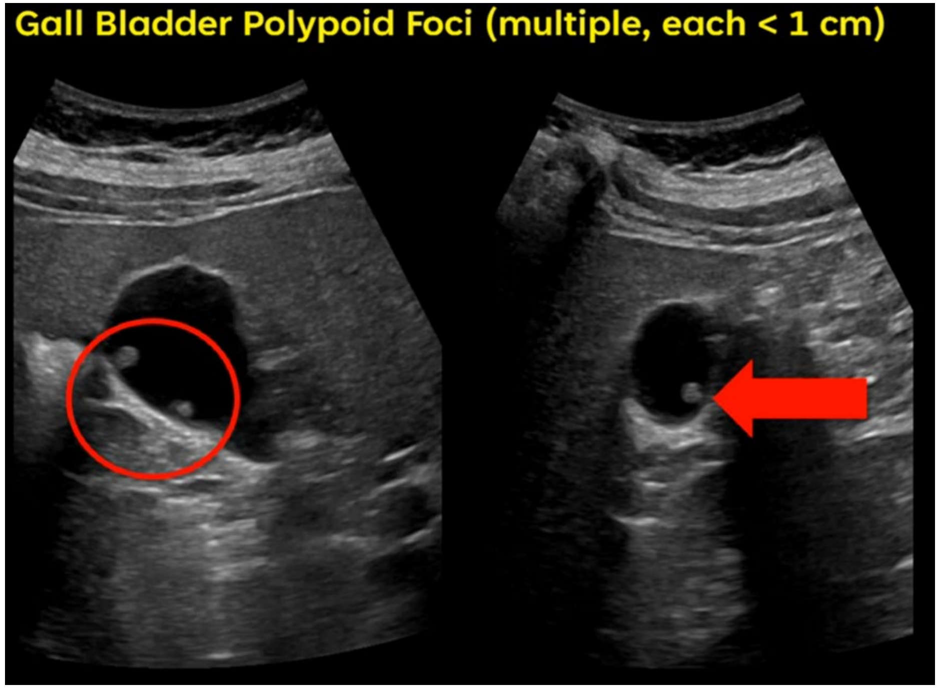
Slide courtesy of Dr. Sundeep Nayak

Radiology can not differentiate pseudopolyp from polyp

Gallbladder Polypoid Foci (GBPF)

- 10% of general population
- Better seen on U/S than MRCP/CT
- If cholesterol, may be slightly brighter than liver
- <6mm, 6-9mm, **>1cm should be called gallbladder luminal or mural mass**





Slide courtesy of Dr. Sundeep Nayak

Looking for a yellow needle in a yellow haystack...

US OF POLYPOID FOCI

(for true polyps)

Sensitivity: 83.1%

Specificity: 96.3%

PPV 14.9% (7% for malignant polyps)

NPV 99.7%

High false positive rate: 85.15%

POLYPOID FOCI AND GB CANCER

10% prevalence of polypoid foci

1 – 3% are true adenomatous polyps with CA potential

US cannot differentiate true from cholesterol pseudopolyps

At risk: >50 yrs, Indian, primary sclerosing cholangitis, sessile

POLYPOID FOCI: SIZE AND CANCER RISK

PPV is cancer detection rate

$\geq$ 10 mm: 16.4%

$\geq$ 15 mm: 55.9%

$\geq$ 20 mm: 94.1%

10 – 20 mm: pooled rate 47.7%; surgical consult

> 20 mm: resect as cancer unless disproven

Slide courtesy of Dr. Sundeep Nayak

Kaiser Permanente Division of Research Delivery Science and Applied Research 2024 Community Health Benefit Grant Project:

Evaluating safety and efficacy of current imaging guidelines for gallbladder polyps

Aim 1: Describe **radiologic polyps** and **masses** and **difference in the number of ultrasounds obtained pre- vs. post- 2020** surveillance guideline change.

Hypothesis 1:

- The number of gallbladders with polyps growing to >10mm will not be statistically different when being followed up **6 and 18** months vs. **24** months.
- The number of **ultrasounds per patient will decrease**

Kaiser Permanente Division of Research Delivery Science and Applied Research 2024 Community Health Benefit Grant Project:

Evaluating safety and efficacy of current imaging guidelines for gallbladder polyps

Aim 1: Describe **radiologic polyps** and **masses** and **difference in the number of ultrasounds obtained** pre- vs. post- 2020 surveillance guideline change.

Results:

- **Half a million abdominal ultrasounds** between 1/1/18 to 8/1/22
  - **39K** with **GBP** (vs. 26K over 20 yrs in Szpakowski & Tucker study)
  - **3,083 with 6-9mm discovery GBP** (GB2a) after exclusions
- **GB2a:**
  - **50 years old** (median), weight class = **overweight, 51% female**
  - **132 (4.3%)** grew to **>10mm** (GB3)
    - Median of **21.6 months** until growth
  - **No significant difference in growth to > 10mm** (GB3) between pre- vs. post- cohorts ($p=0.551$)
  - **More ultrasounds in pre- (1702) than post- (1381) period** $p<0.001$
  - **Full adherence post- 36%** vs. pre- 30%

Cholecystectomy and Pathology

- **72%** (94 of 132) **of GB2a patients that had growth to >10mm underwent cholecystectomy**
  - More cholecystectomies 80% pre vs 63% post (p=0.033)
  - **Only 15%** (14 of 94) of cholecystectomy **specimens agreed with radiographic polyp growth to > 10mm**
    - **No difference between pre- and post – cohorts** (p=0.413)
  - **Pathology of 94 patients undergoing cholecystectomy:**
    - **68% had just cholesterol polyps**
    - **19% had only gallstones seen, no polyps**
    - Only 10% had non-cholesterol polyps
    - 5% were normal gallbladders (no polyps, no stones)
- 263 patients with GB2a polyps underwent cholecystectomy
  - **Therefore, 62% (169) of GB2a cholecystectomies were likely due to reasons such as symptomatic cholelithiasis and not related to size/growth.**

Logistic Regression Analysis for polyp growth

- Time period, Age, Sex, BMI, Tobacco, Diabetes do not appear to be factors that contribute to polyp growth from 6-9mm to >10mm.
- Patients with **gallstones** had **2.8** (1.9-4.0) adjusted odds ratio of polyp growth, **p <0.01** vs. no gallstones
  - **However, our analysis of pathologic specimens also found that most polyps reported on ultrasound were likely gallstones (38% with gallstones and polyps, 19% only stones).**

Looking for a yellow needle in a yellow haystack...

US OF POLYPOID FOCI
(for true polyps)

Sensitivity: 83.1% **10% in our study**

Specificity: 96.3%

PPV 14.9% **11.5% in our study**

NPV 99.7%

High false positive rate: 85.15%

89.4% in our study

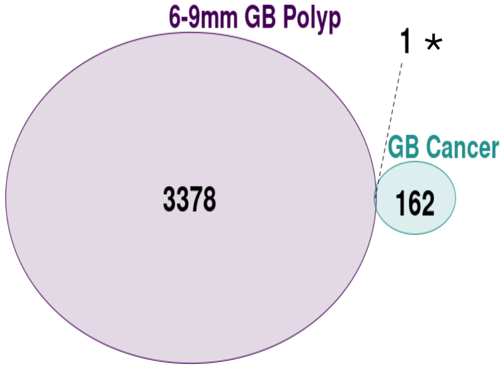
Kaiser Permanente Division of Research Delivery Science and Applied Research 2024 Community Health Benefit Grant Project:

Evaluating safety and efficacy of current imaging guidelines for gallbladder polyps

Aim 2: Describe **gallbladder cancer** diagnosed following an ultrasound (2018 – 2023). Compare/Describe **frequency** and **characteristics (size, growth)** of gallbladder cancer patients with/without **gallbladder polyp discovered on ultrasound.**

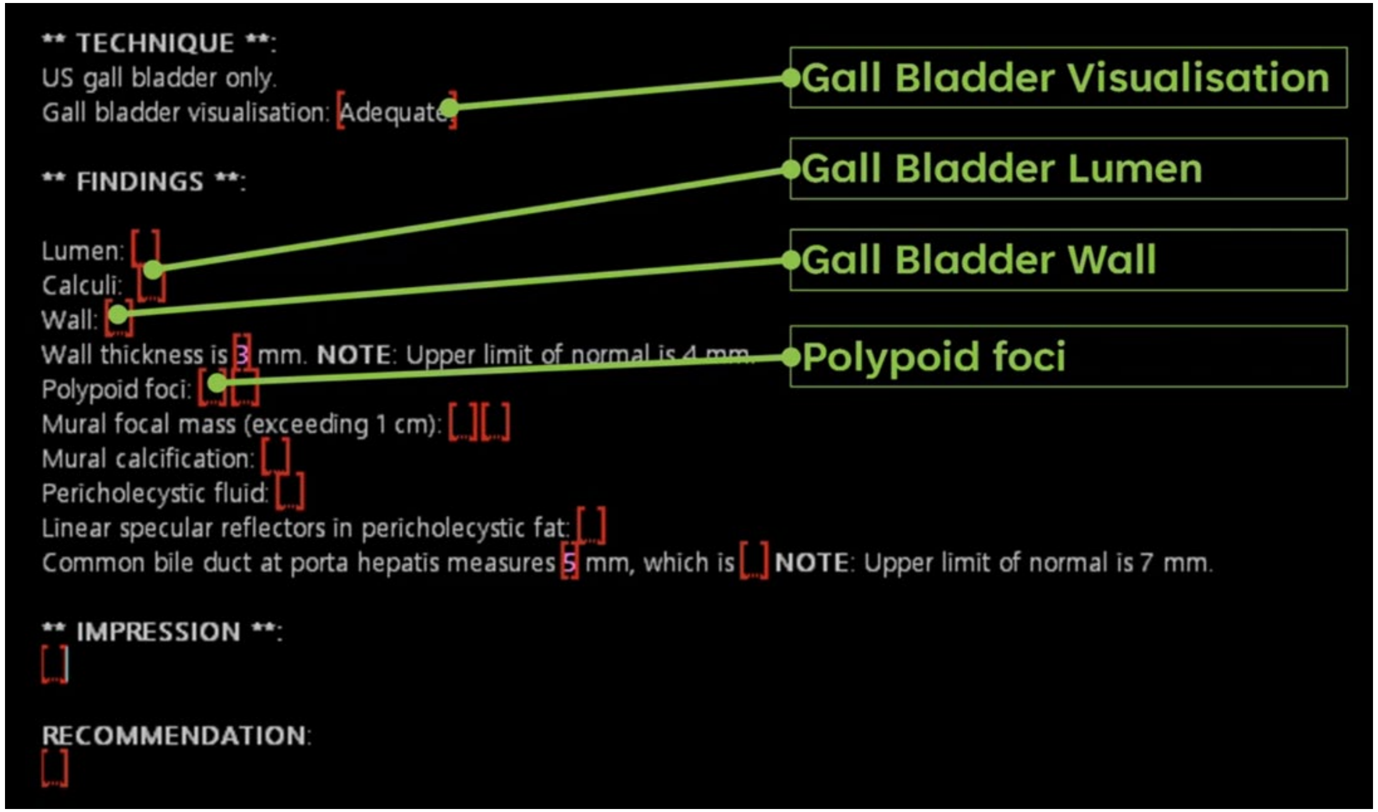
- **163 Primary GBC patients with ultrasound at least 2 years prior to diagnosis**
- **Of 39K GBP, only 1 patient had GBC** (0.003%)
  - That patient was from 3.4K GB2a patients (0.03% of GBP 3-9mm)
  - Identified during the washout period
  - Time between GB2a to pathology was 224 days (**7 months**)
  - Pathology: Tubular Adenoma with High-Grade Dysplasia (**Carcinoma in Situ**)

***57 yo female, white, no significant past medical history**
9/10/2020: ED for RUQ pain, diarrhea. U/S no evidence of acute cholecystitis, +gallstones, 9mm polyp
10/6/2020: Surgery Office Consultation, plan for surgery
4/22/2021: Laparoscopic cholecystectomy, pathology = Tubular Adenoma with high grade dysplasia (in situ carcinoma)



Future directions: Synoptics = Better data?

Sample KP Ultrasound Report:


** TECHNIQUE **:
US gall bladder only.
Gall bladder visualisation: [Adequate]

** FINDINGS **:

Lumen: [...]
Calculi: [...]
Wall: [...]
Wall thickness is [3] mm. NOTE: Upper limit of normal is 4 mm.
Polypoid foci: [...][...]
Mural focal mass (exceeding 1 cm): [...][...]
Mural calcification: [...]
Pericholecystic fluid: [...]
Linear specular reflectors in pericholecystic fat: [...]
Common bile duct at porta hepatis measures [5] mm, which is [...] NOTE: Upper limit of normal is 7 mm.

** IMPRESSION **:
[...]

RECOMMENDATION:
[...]

Radiology research:

- Ma, NQ, Lv, HY, Bi, J, et al. A scoring system for gallbladder polyps based on the cross-sectional area and patient characteristics. Asian J Surg 2022:45(1), 332-338.

Future directions: Lessons from GBC cohort?

- **Setting**
  - **66% diagnosed via the ER admission, 30% with initial diagnosis of acute cholecystitis**
  - **18% diagnosed via outpatient gallbladder mass work-up**
  - **17% diagnosed via outpatient cholelithiasis work-up**
  - **6% diagnosed via outpatient gallbladder polyp work-up**
- **Pre-op Imaging**
  - **88% did not have an ultrasound reporting a polyp** prior to final ultrasound prior to pathology (can't even screen based on polyps)
  - **73% with only a single ultrasound prior to pathologic diagnosis**
  - **30% with mass on last ultrasound** prior to pathology
  - **24% with polypoid** structure reported on ultrasound
  - **4.7 years** = median time between **first ultrasound mentioning gallstones and last ultrasound prior to pathology**
- **Surgery**
  - **78% diagnosed via cholecystectomy** specimen
- **Pathology**
  - 90% of primary GB Cancers are **Adenocarcinoma**
  - **13 days** = median time between **last ultrasound and pathology** (mostly ED-inpatient?)
  - **40 days** = median time between **mass** on U/S and pathology (mostly outpatient?)
- **Wall thickening**
  - **48%** of last **ultrasounds** prior to pathology report **thickened gallbladder wall**
  - **37%** of **pathologic** specimens report **thickened gallbladder wall**
- **Pre vs. Post 2020 Cohorts**
  - **No difference between percentage of deaths due to GBC**
  - Pathologic stage of cancer?
  - Median days between last ultrasound and pathology **Pre 21 days** vs **Post 4 days p <0.01**
    - **Post with more ED diagnosis than Pre p=0.03**
    - Post with more reports of thick gallbladder wall – more ED acute cholecystitis (39 vs. 22%)?
    - Pre with more outpatient cholelithiasis (24% vs. 10%)

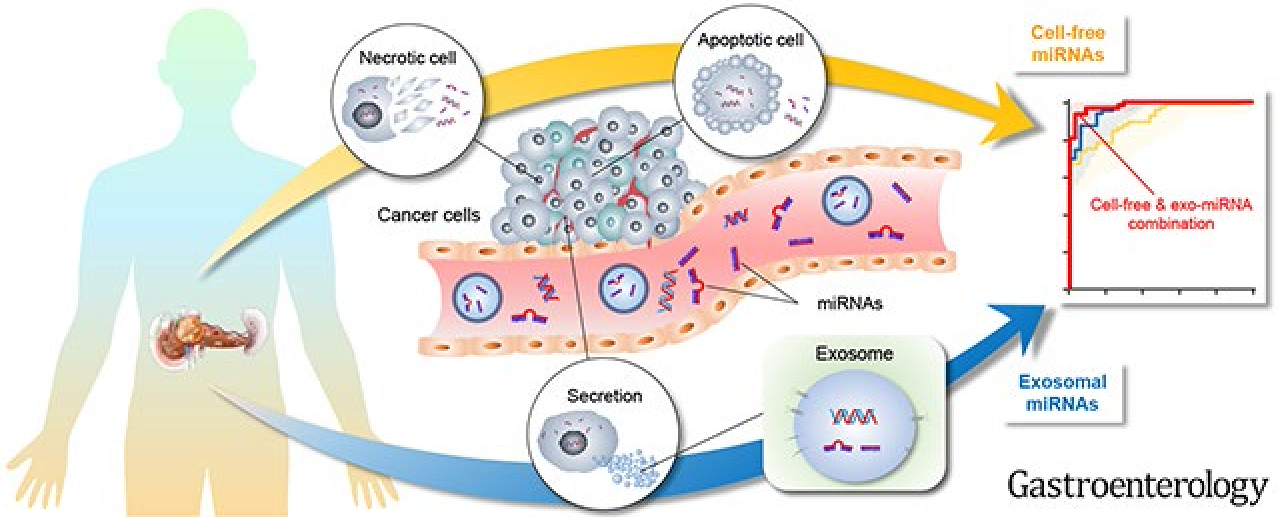
Future directions: Blood / Urine/ Stool test like in Pancreatic Cancer?

SPANDIDOS PUBLICATIONS MOLECULAR MEDICINE REPORTS 17: 6449-6455, 2018

Screening for key lncRNAs in the progression of gallbladder cancer using bioinformatics analyses

LEI ZHANG, ZHIMIN GENG, XIANKUI MENG, FANDI MENG and LIN WANG

Department of Geriatric Surgery, The First Affiliated Hospital of Xi'an Jiaotong University, Xi'an, Shaanxi 710061, P.R. China



Gastroenterology

Nakamura K, Zhu Z, Roy S, Jun E, Han H, Munoz RM, Nishiwada S, Sharma G, Cridebring D, Zenhausern F, Kim S, Roe DJ, Darabi S, Han IW, Evans DB, Yamada S, Demeure MJ, Becerra C, Celinski SA, Borazanci E, Tsai S, Kodera Y, Park JO, Bolton JS, Wang X, Kim SC, Von Hoff D, Goel A. An Exosome-based Transcriptomic Signature for Noninvasive, Early Detection of Patients With Pancreatic Ductal Adenocarcinoma: A Multicenter Cohort Study. Gastroenterology. 2022 Nov;163(5):1252-1266.e2. doi: 10.1053/j.gastro.2022.06.090. Epub 2022 Jul 16. PMID: 35850192; PMCID: PMC9613527.

Am J Cancer Res 2014;4(6):663-673
www.ajcr.us /ISSN:2156-6976/ajcr0001827

Original Article

MicroRNAs in stool samples as potential screening biomarkers for pancreatic ductal adenocarcinoma cancer

Jian-Yu Yang*, Yong-Wei Sun*, De-Jun Liu, Jun-Feng Zhang, Jiao Li, Rong Hua

*Department of Biliary-Pancreatic Surgery, Ren Ji Hospital, Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai, 200127, China. *Co-first authors.*

Received August 11, 2014; Accepted September 28, 2014; Epub November 19, 2014; Published November 30, 2014

PLOS MEDICINE

RESEARCH ARTICLE

A combination of urinary biomarker panel and PancRISK score for earlier detection of pancreatic cancer: A case–control study

Silvana Debernardi[1], Harrison O'Brien[1], Asma S. Algahmdi[1], Nuria Malats[2,3], Grant D. Stewart[4], Marija Plješa-Ercegovac[5], Eithne Costello[6], William Greenhalf[6], Amina Saad[7], Rhiannon Roberts[7], Alexander Ney[8], Stephen P. Pereira[8], Hemant M. Kocher[7], Stephen Duffy[9], Oleg Blyuss[10,11,12], Tatjana Crnogorac-Jurcevic[1]*

1 Centre for Cancer Biomarkers and Biotherapeutics, Barts Cancer Institute, Queen Mary University of London, London, United Kingdom, 2 Centro Nacional de Investigaciones Oncológicas, Madrid, Spain, 3 Centro de Investigación Biomédica en Red de Cáncer, Madrid Spain, 4 Department of Surgery, University of Cambridge, Cambridge, United Kingdom, 5 Institute of Medical and Clinical Biochemistry, Faculty of Medicine, University of Belgrade, Belgrade, Serbia, 6 Molecular and Clinical Cancer Medicine, University of Liverpool, Liverpool, United Kingdom, 7 Centre for Tumour Biology, Barts Cancer Institute, Queen Mary University of London, London, United Kingdom, 8 Institute for Liver and Digestive Health, University College London, London, United Kingdom, 9 Centre for Cancer Prevention, Wolfson Institute of Preventive Medicine, Queen Mary University of London, London, United Kingdom, 10 School of Physics, Astronomy and Mathematics, University of Hertfordshire, Hatfield, United Kingdom, 11 Department of Paediatrics and Paediatric Infectious Diseases, Institute of Child Health, Sechenov First Moscow State Medical University, Moscow, Russia, 12 Department of Applied Mathematics, Lobachevsky State University of Nizhny Novgorod, Nizhny Novgorod, Russia

* t.c.jurcevic@qmul.ac.uk

Check for updates

OPEN ACCESS

Citation: Debernardi S, O'Brien H, Algahmdi AS, Malats N, Stewart GD, Plješa-Ercegovac M, et al. (2020) A combination of urinary biomarker panel and PancRISK score for earlier detection of pancreatic cancer: A case–control study. PLoS Med 17(12): e1003489. https://doi.org/10.1371/journal.pmed.1003489

Abstract

References

1. Vo-Phamhi, JM, Tiyarattanachai, T, Matuszczak, M, et al. Follow-up Imaging and Surgical Costs Associated with Different Guidelines for Management of Incidentally Detected Gallbladder Polyps. Acad Radiol 2025:32(2), 757-766.
2. Riddell, ZC, Corallo, C, Albazaz, R, et al. Gallbladder polyps and adenomyomatosis. Br J Radiol 2023:96(1142), 20220115.
3. Kamaya, A, Fung, C, Szpakowski, JL, et al. Management of Incidentally Detected Gallbladder Polyps: Society of Radiologists in Ultrasound Consensus Conference Recommendations. Radiology 2022:305(2), 277-289.
4. Foley, KG, Riddell, Z, Coles, B, et al. Risk of developing gallbladder cancer in patients with gallbladder polyps detected on transabdominal ultrasound: a systematic review and meta-analysis. Br J Radiol 2022:95(1137), 20220152.
5. Gunes, Y, Tasdelen, I, Ergin, A, et al. A New Risk Scoring System to Predict Malignancy in Gallbladder Polyps: a Single-Center Study. J Gastrointest Surg 2022:26(9), 1846-1852.
6. Aziz, H, Hewitt, DB, Pawlik, TM. Critical Analysis of the Updated Guidelines for Management of Gallbladder Polyps. Ann Surg Oncol 2022:29(6), 3363-3365.
7. Middleton, WD, Fung, C, Dahiya, N, et al. Survey Study on the Experience, Practice Patterns, and Preferences of the Fellows of the Society of Radiologists in Ultrasound for Evaluation and Management of Gallbladder Polyps Detected With Ultrasound. Ultrasound Q 2022:38(2), 96-102.
8. Walsh, AJ, Bingham, DB, Kamaya, A. Longitudinal Ultrasound Assessment of Changes in Size and Number of Incidentally Detected Gallbladder Polyps. AJR Am J Roentgenol 2022:218(3), 472-483.
9. Ma, NQ, Lv, HY, Bi, J, et al. A scoring system for gallbladder polyps based on the cross-sectional area and patient characteristics. Asian J Surg 2022:45(1), 332-338.
10. Roa, JC, Basturk, O, Adsay, V. Dysplasia and carcinoma of the gallbladder: pathological evaluation, sampling, differential diagnosis and clinical implications. Histopathology 2021:79(1), 2-19.
11. Wennmacker, SZ, de Savornin Lohman, EAJ, Hasami, NA, et al. Overtreatment of Nonneoplastic Gallbladder Polyps due to Inadequate Routine Ultrasound Assessment. Dig Surg 2020:1-7.
12. Bird, JR, Brahm, GL, Fung, C, et al. Recommendations for the Management of Incidental Hepatobiliary Findings in Adults: Endorsement and Adaptation of the 2017 and 2013 ACR Incidental Findings Committee White Papers by the Canadian Association of Radiologists Incidental Findings Working Group. Can Assoc Radiol J 2020:71(4), 437-447.
13. Szpakowski, JL, Tucker, LY. Outcomes of Gallbladder Polyps and Their Association With Gallbladder Cancer in a 20-Year Cohort. JAMA Netw Open 2020:3(5), e205143.
14. Lodhi, A, Waite, K, Alam, I. The accuracy of ultrasonography for diagnosis of gallbladder polyps. Radiography (Lond) 2020:26(2), 52-55.
15. Patel, K, Dajani, K, Vickramarajah, S, et al. Five year experience of gallbladder polyp surveillance and cost effective analysis against new European consensus guidelines. HPB (Oxford) 2019:21(5), 636-642.
16. Zhang, L, Geng, Z, Meng, X, et al. Screening for key lncRNAs in the progression of gallbladder cancer using bioinformatics analyses. Mol Med Rep 2018:17(5), 6449-6455.
17. Choi, TW, Kim, JH, Park, SJ, et al. Risk stratification of gallbladder polyps larger than 10 mm using high-resolution ultrasonography and texture analysis. Eur Radiol 2018:28(1), 196-205.
18. Xu, A, Zhang, Y, Hu, H, et al. Gallbladder Polypoid-Lesions: What Are They and How Should They be Treated? A Single-Center Experience Based on 1446 Cholecystectomy Patients. J Gastrointest Surg 2017:21(11), 1804-1812.
19. Wiles, R, Thoeni, RF, Barbu, ST, et al. Management and follow-up of gallbladder polyps: Joint guidelines between the European Society of Gastrointestinal and Abdominal Radiology (ESGAR), European Association for Endoscopic Surgery and other Interventional Techniques (EAES), International Society of Digestive Surgery - European Federation (EFISDS) and European Society of Gastrointestinal Endoscopy (ESGE). Eur Radiol 2017:27(9), 3856-3866.
20. Bhatt, NR, Gillis, A, Smoothey, CO, et al. Evidence based management of polyps of the gallbladder: A systematic review of the risk factors of malignancy. Surgeon 2016:14(5), 278-286.
21. Elmasry, M, Lindop, D, Dunne, DF, et al. The risk of malignancy in ultrasound detected gallbladder polyps: A systematic review. Int J Surg 2016:33 Pt A, 28-35.
22. Babu, BI, Dennison, AR, Garcea, G. Management and diagnosis of gallbladder polyps: a systematic review. Langenbecks Arch Surg 2015:400(4), 455-462.
23. Lindor, KD, Kowdley KV, Harrison, EM. ACG Clinical Guideline: Primary Sclerosing Cholangitis. Am J Gastroenterol 2015:110(5): 646-659; quiz 660.
24. Wernberg, JA, Lucarelli, DD. Gallbladder cancer. Surg Clin North Am 2014:94(2), 343-360.
25. Sebastian, S, Araujo, C, Neitlich, JD, et al. Managing incidental findings on abdominal and pelvic CT and MRI, Part 4: white paper of the ACR Incidental Findings Committee II on gallbladder and biliary findings. J Am Coll Radiol 2013:10(12), 953-956.
26. American Society for Gastrointestinal Endoscopy Standards of Practice. The role of endoscopy in the evaluation and treatment of patients with biliary neoplasia. Gastrointest Endosc 2013:77(2), 167-174.
27. Cairns, V, Neal, CP, Dennison, AR, et al. Risk and Cost-effectiveness of Surveillance Followed by Cholecystectomy for Gallbladder Polyps. Arch Surg 2012:147(12), 1078-1083.
28. Matos, ASB, Baptista, HN, Pinheiro, C, et al. Gallbladder polyps. How and when to treat them? Journal of the Brazilian Medical Association 2010:56(3).
29. Park, JY, Hong, SP, Kim, YJ, et al. Long-term follow up of gallbladder polyps. J Gastroenterol Hepatol 2009:24(2), 219-222.
30. Zielinski, MD, Atwell, TD, Davis, PW, et al. Comparison of surgically resected polypoid lesions of the gallbladder to their pre-operative ultrasound characteristics. J Gastrointest Surg 2009:13(1), 19-25.
31. Aldouri, AQ, Malik, HZ, Waytt, J, et al. The risk of gallbladder cancer from polyps in a large multiethnic series. Eur J Surg Oncol 2009:35(1), 48-51.