

# **Efficacy of pineapple juice as a negative oral contrast agent in magnetic resonance cholangiopancreatography**



Rosa Alba Pugliesi, MD  
Klinikum Ludwigsburg, Germany



## **Learning objectives**

- ❖ **To illustrate the role of MRCP in biliary pathologies**
- ❖ **To show our MRCP protocol**
- ❖ **To optimize the MRCP protocol with the use of high natural manganese content Juice (pineapple juice)**

# Background

**Magnetic resonance cholangiopancreatography (MRCP) is an alternative to diagnostic endoscopic retrograde cholangiopancreatography (ERCP) for imaging the biliary tree and investigating biliary obstruction.**

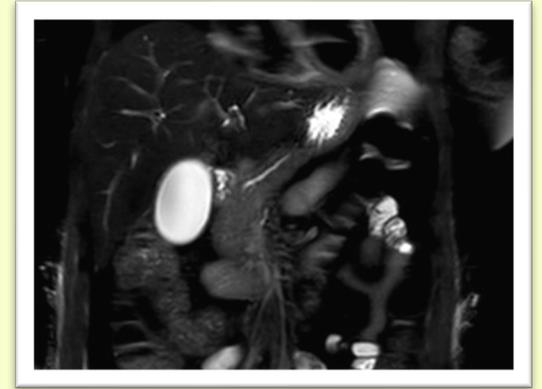
**While ERCP is used for both diagnosis and treatment, MRCP is just a not invasive diagnostic method that does not have the small morbidity and mortality risks associated with ERCP.**

## **MRCP Indications**

**Indications for the use of MRCP include:**

- **patient preference for non-invasive imaging;**
- **unsuccessful or contraindicated ERCP;**
- **patients with risk of having pancreatic or biliary disease such as patients with a suspected neoplastic cause for pancreatic or biliary obstruction.**

# Material and Methods



## Our MRCP standard protocol include:

### PRE INIEJCTION

- Multiplanar localizer
- **2 glasses (ca. 400 ml) of pineapple juice 15 min bevor to start the MRCP**
- T2 Haste coronal 4 mm
- T1 fl2D in/op phase axial 4 mm
- T2 TSE axial 4 mm
- T2 HASTE FS axial 4 mm
- Diffusion b=50, 400, 800 axial 4 mm
- T2 FS Space 3D (MRCP) coronal 1 mm, MIP Reconstruction

### INJECTION

0,1 mmol/kg body weight Gadolinium

### POST INJECTION

- T1 VIBE FS native & 20, 60, 180s post KM axial 3 mm
- T1 fl2D FS axial and coronal 4 mm

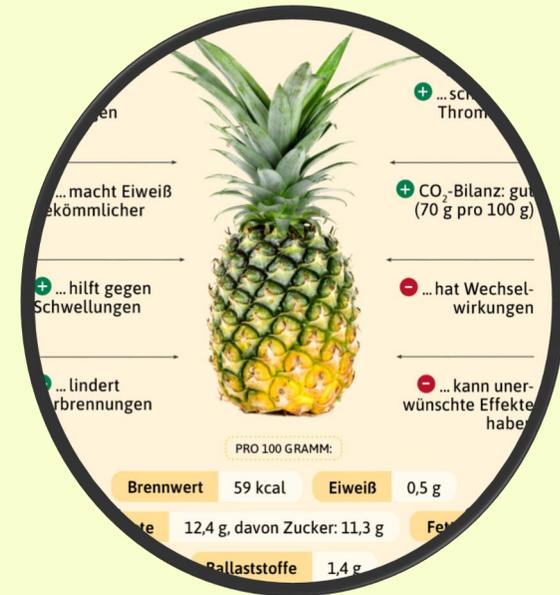
## Why do we use pineapple juice?

During the MRCP, the pancreatobiliary ducts can be obscured by the high-intensity signal from the stomach and duodenum.

Pineapple juice has a high natural manganese content that increase T1- and decreasing T2-signal intensity.

It is an alternative to commercially available negative contrast agents.

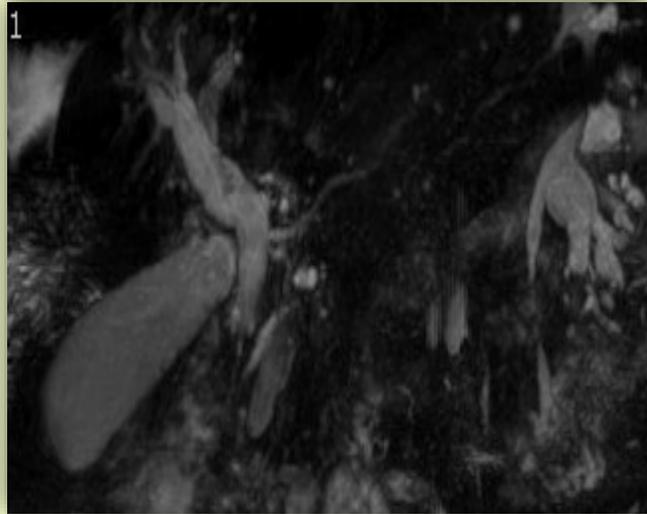
Many studies have showed that pineapple juice is comparable to the commercially available negative contrast agent ferumoxsil.(14)



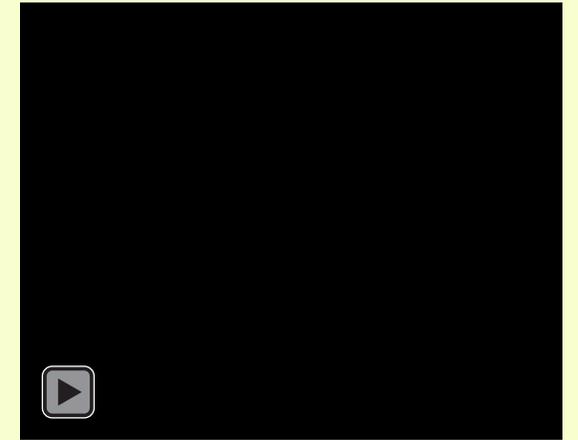
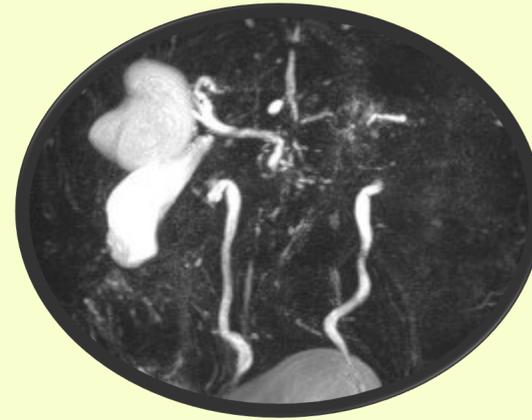
## Main advantages:

- ❖ Palatable and well tolerated by the patients;
- ❖ not toxic;
- ❖ evenly distributed in the gastrointestinal tract;
- ❖ diluted during transit or stimulate peristalsis;
- ❖ not expensive.

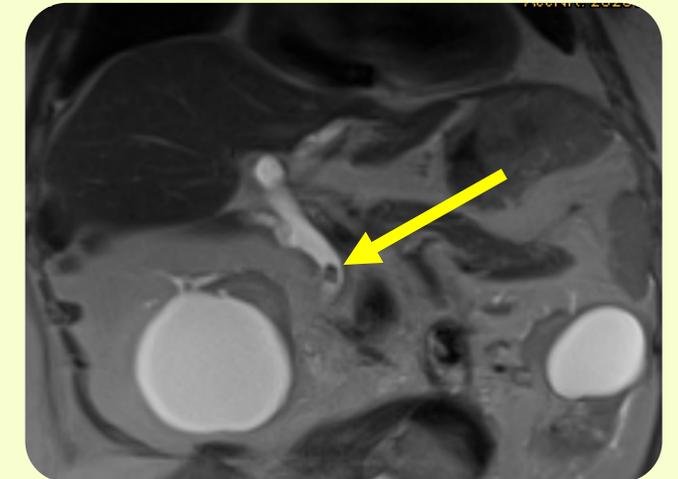
**Examples from our experience:**



**Without PJ**

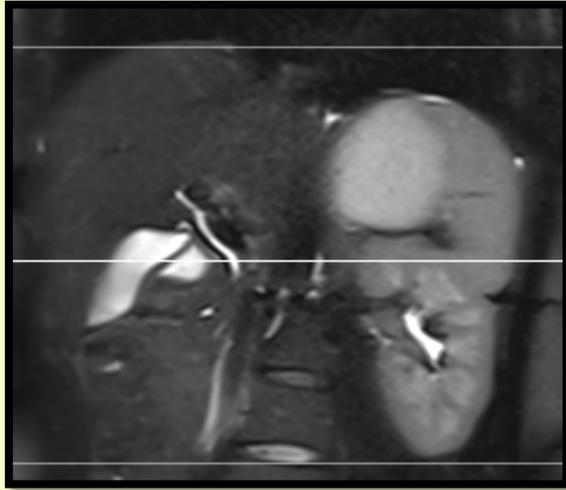


**T2 space cor after pineapple juice (PJ). Note: cholecystolithiasis**

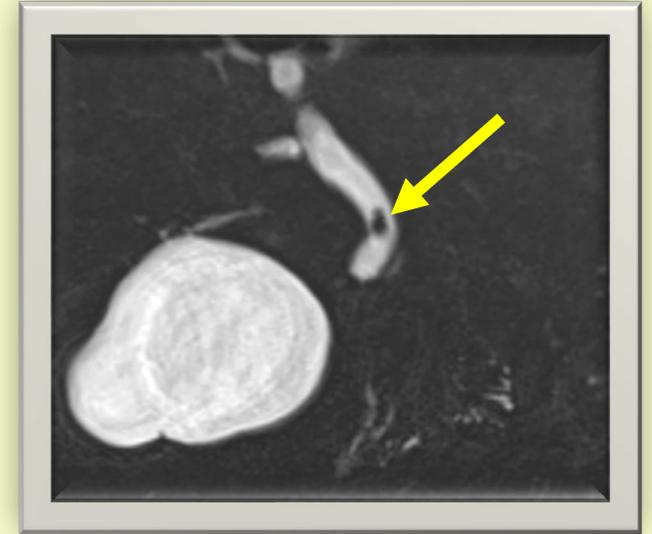
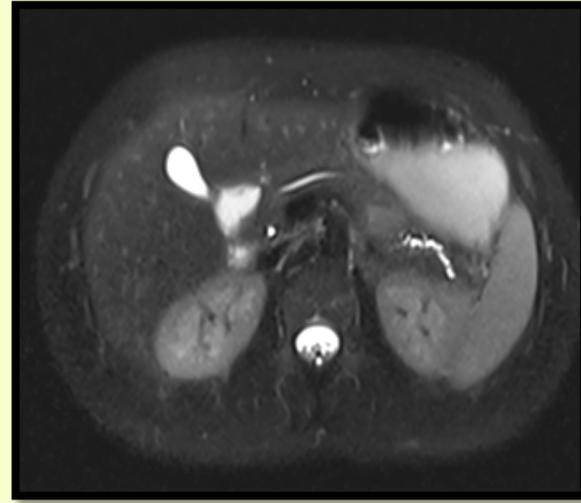


**Native-phase images after 2 glasses PJ:  
T2 space coronal MIP(left) and T2 haste coronal (right). Here note  
the choledocholithiasis ( yellow arrow)**

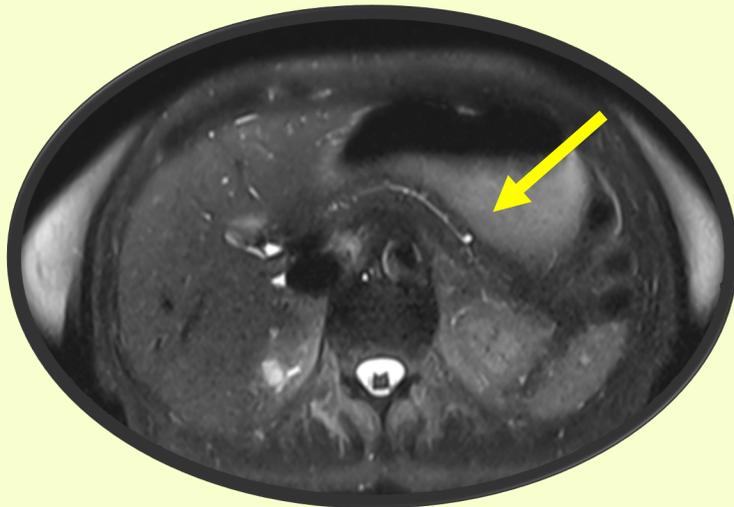
MRI-images after 2 glasses Pineapple juice:



T2 haste fs coronal and axial



T2 space 3D coronal showing choledocholithiasis

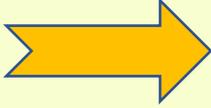


T2 fat suppressed (fs) axial showing IPMN



T2 haste fs coronal in RARE sequences

## Results



Our evaluation demonstrated that pineapple juice (PJ) shortened T2 relaxation time and hence decreased T2 signal intensity on a standard MRCP sequence to a similar degree for a commercially available negative contrast agent. Electrothermal atomic absorption spectrometry assay demonstrated a high manganese concentration in PJ of 2.76 mg/dl, which is likely to be responsible for T2 imaging properties.

## Conclusion

MRCP is useful in biliary variant anatomy, biliary cysts, and gallbladder dysfunction including pancreatic tumor and cholecystitis.

Ingestion of pineapple juice (PJ) provides effective signal suppression in the GI tract on MRCP, similar to paramagnetic contrast agents. At 15 minutes following PJ, the visualization of the ampulla, common bile duct, common hepatic, and central intrahepatic ducts is significantly improved.

## References:

1. Koo KP, Traverse WW. Do preoperative indicators predict the presence of common bile duct stones during laparoscopic cholecystectomy? *Am J Surg.* 1996;171(5):495–499. [https://doi.org/10.1016/S0002-9610\(97\)89611-0](https://doi.org/10.1016/S0002-9610(97)89611-0)
2. Alshehri F. M. (2015). Comparative study of pineapple juice as a negative oral contrast agent in magnetic resonance cholangiopancreatography. *Journal of clinical and diagnostic research : JCDR*, 9(1), TC13–TC16. <https://doi.org/10.7860/JCDR/2015/10240.5463> (Retraction published *J Clin Diagn Res.* 2017 Jun;11(6):ZZ01)
3. Heller SL, Lee VS. MR imaging of the gallbladder and biliary system. *Magn Reson Imaging Clin N Am.* 2005;13(2):295–311. <https://doi.org/10.1016/j.mric.2005.03.003>
4. Kats J, Kraai M, Dijkstra AJ, et al. Magnetic resonance cholangiopancreatography as a diagnostic tool for common bile duct stones: A comparison with ERCP and clinical follow-up. *Dig Surg.* 2003;20(1):32–37. <https://doi.org/10.1159/000068863>
5. Parashari UC, Khanduri S, Bhadury S, Upadhyay D, Kishore K. Diagnostic role of magnetic resonance cholangiopancreatography in evaluation of obstructive biliopathies and correlating it with final diagnosis and clinical profile of patients. *J Nat Sci Biol Med.* 2015;6(1):131–138. <https://doi.org/10.4103/0976-9668.149110>
6. Hjartarson JH, Hannesson P, Sverrisson I, Blöndal S, Ívarsson B, Björnsson ES. The value of magnetic resonance cholangiopancreatography for the exclusion of choledocholithiasis. *Scand J Gastroenterol.* 2016;51(10):1249–1256. <https://doi.org/10.1080/00365521.2016.1182584>
7. Boraschi P, Neri E, Braccini G, et al. Cholelithiasis: Diagnostic accuracy of MR cholangiopancreatography. Three-year experience. *Magn Reson Imaging.* 1999;17(9):1245–1253. [https://doi.org/10.1016/S0730-725X\(99\)00075-2](https://doi.org/10.1016/S0730-725X(99)00075-2)
8. Adamek HE, Albert J, Weitz M, Breer H, Schilling D, Riemann JF. A prospective evaluation of magnetic resonance cholangiopancreatography in patients with suspected bile duct obstruction. *Gut.* 1998;43(5):680–683. <https://doi.org/10.1136/gut.43.5.680>
9. Sheryl Mohabir, Richard D. Pitcher, Rubeshan Perumal, Matthew D.M. Goodier. Received: 26 Feb. 2020; Accepted: 13 May 2020; Published: 29 July 2020. The efficacy of pineapple juice as a negative oral contrast agent in magnetic resonance cholangiopancreatography. Copyright: © 2020. The Author(s). Licensee: AOSIS.
10. Arrive L, Coudray C, Azizi L, et al. Pineapple juice as a negative oral contrast agent in magnetic resonance cholangiopancreatography. *J Radiol.* 2016;88(11 Pt 1):1689–1694. [https://doi.org/10.1016/S0221-0363\(07\)74047-7](https://doi.org/10.1016/S0221-0363(07)74047-7)
11. Coppens E, Metens T, Winant C, Matos C. Pineapple juice labeled with gadolinium: A convenient oral contrast for magnetic resonance cholangiopancreatography. *Eur Radiol.* 2005;15(10):2122–2129. <https://doi.org/10.1007/s00330-005-2835-5>
12. Wenker M, Vockelmann C, Schymura-Zahn A, Coesfeld DE. MRCP-alternatives to oral contrast agents containing iron oxide. *ECR [serial online].* 2015 [cited 2015 Mar 04]. Available from: <https://doi.org/10.1594/ecr2015/C-1913>
13. Duarte JA, Furtado APA, Marroni CA. Use of pineapple juice with gadopentetate dimeglumine as a negative oral contrast for magnetic resonance cholangiopancreatography: A multicentric study. *Abdom Imaging.* 2012;37(3):447–456. <https://doi.org/10.1007/s00261-011-9761-6>
14. Arrive L, Coudray C, Azizi L, et al. Pineapple juice as a negative oral contrast agent in magnetic resonance cholangiopancreatography. *J Radiol.* 2016;88(11 Pt 1):1689–1694. [https://doi.org/10.1016/S0221-0363\(07\)74047-7](https://doi.org/10.1016/S0221-0363(07)74047-7)