

The Utility of Shear Wave Elastography to Predict Oesophageal Varices, Morbidity and Mortality, in Patients with Advanced Hepatic Fibrosis

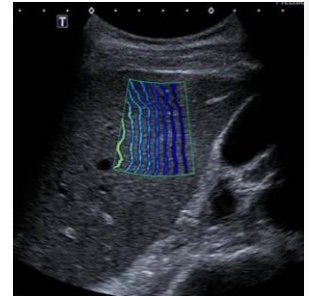
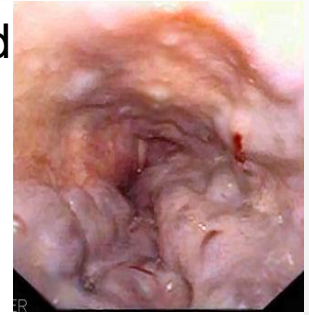
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Background

- Variceal bleeding is a life-threatening complication of advanced liver disease
 - Mortality of up to 50% following a bleeding episode
- Endoscopy is resource intensive and invasive
- Better non-invasive predictors are needed
- Shear wave elastography is promising tool
 - Paucity of data for predicting OV, morbidity and mortality





Shear Wave Elastography



Aims

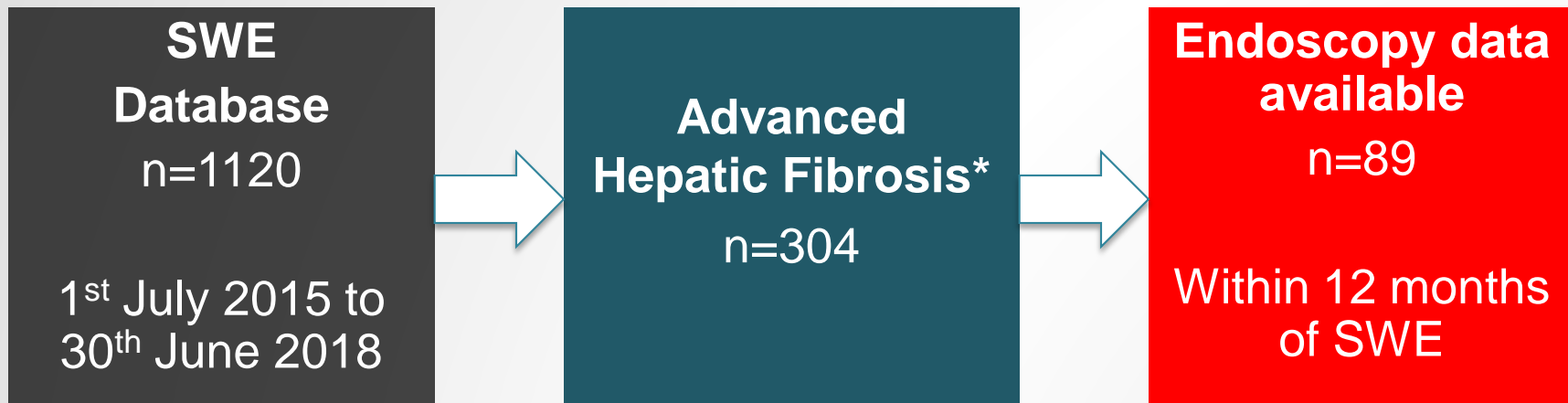
Primary Aims

- To determine whether SWE-derived LSM correlate with OV
- To determine a SWE-specific cut-off score to rule out OV

Secondary Aims

- To determine the predictive power of SWE for:
 - Morbidity and Mortality

Methods



* Fibrosis stage \geq F3 equivalent (*Herrmann E et al. J Hep, 2015*)

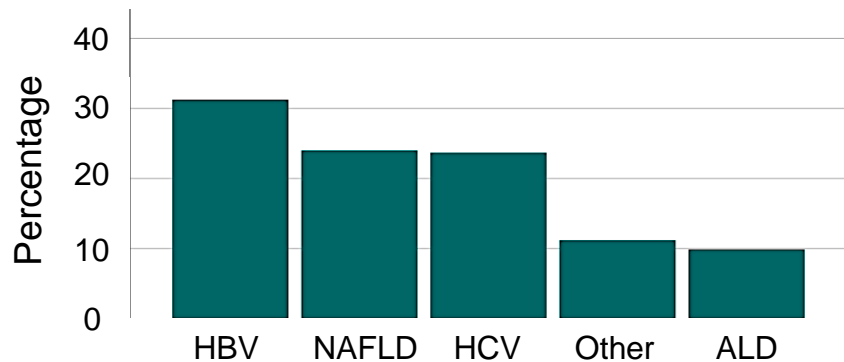
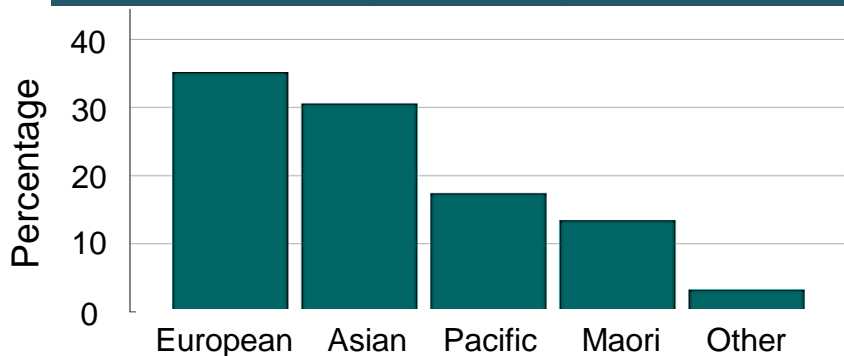
- SWE Score \geq 8.1kPa for HBV
- \geq 9.2kPa for all other aetiologies

Methods

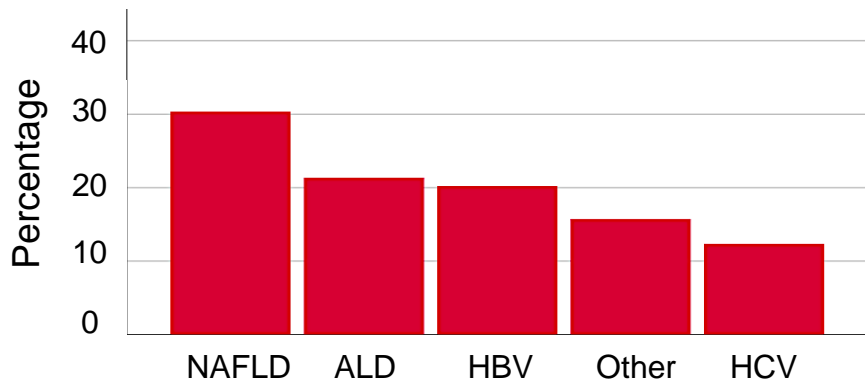
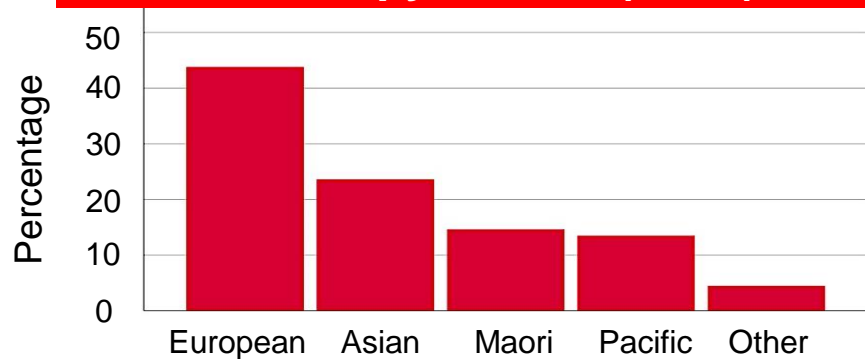
- **Population Characteristics**
 - Age, sex, ethnicity, aetiology of liver disease
- **Serum Biochemistry** (within 3 months of SWE)
 - ALT, AST, ALP, GGT, Albumin, Bilirubin, PT, MELD score
- **Morbidity and Mortality** (followed up to 3 years)
 - All-cause, liver-disease related and infection related admissions, deaths
- **Endoscopy Results** (within 12 months of SWE)
 - Presence of varices, time between endoscopy and SWE, beta-blocker use
- **Analysis using SPSS Statistics v25**

Results | Population Characteristics

Total Cohort (n=304)



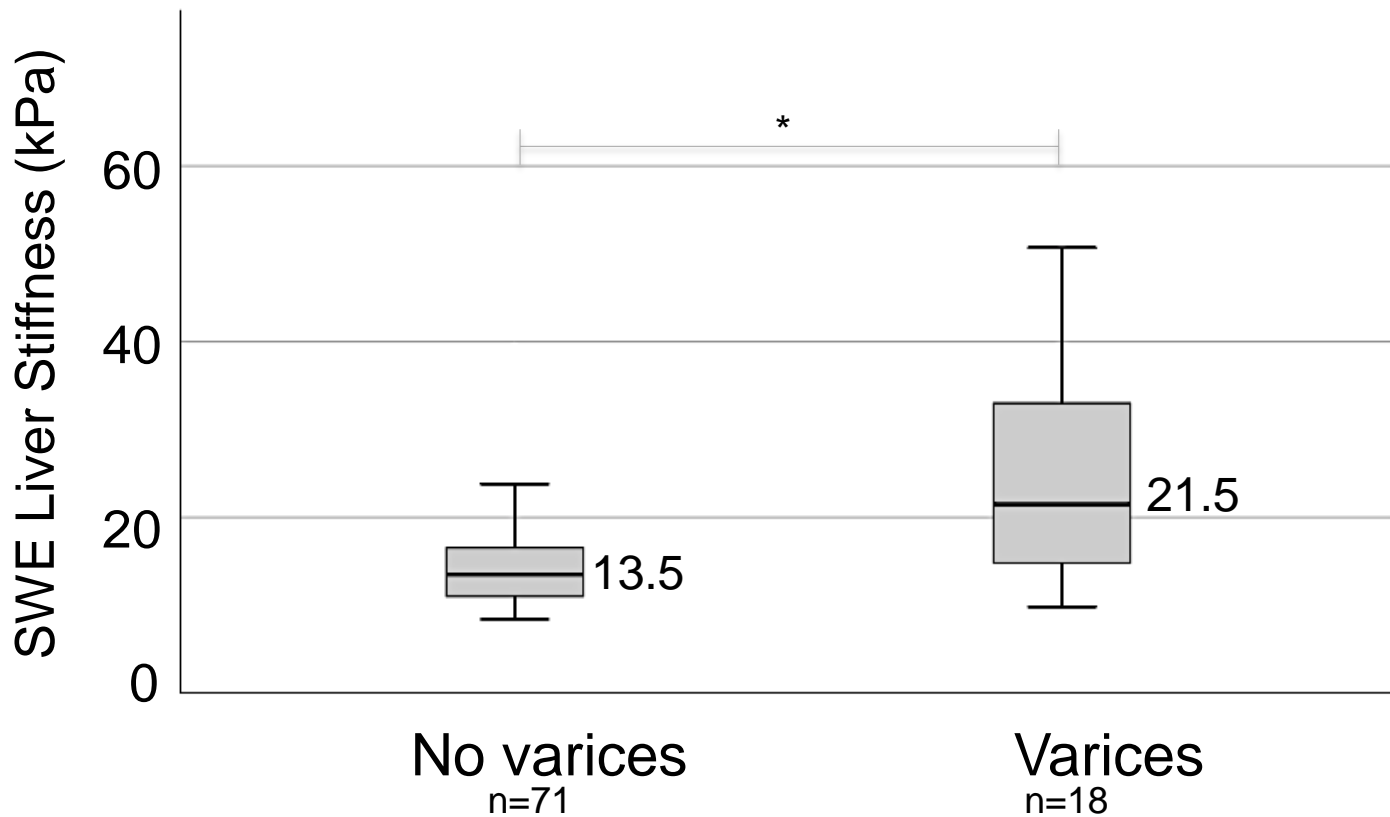
Endoscopy Cohort (n=89)



Results | Population Characteristics

	Total Cohort n=304	Endoscopy Cohort n=89
Median Age (Years [IQR])	58 [50-66]	60 [50-71]
Median BMI [IQR]	28 [24-32]	28 [25-33]
Sex (% Male)	70.4	61.8
Biochemistry (Median [Range])		
ALT (U/L)	52 [34-103]	35 [24-66]
Bilirubin ($\mu\text{mol/L}$)	10 [8-15]	12 [7-24]
Albumin (g/L)	36 [32-39]	34 [23-38]
Prothrombin ratio	1.0 [0.95-1.1]	1.0 [1-1.1]
Platelet count ($\times 10^9/\text{L}$)	199 [151-246]	172 [126-230]
MELD score	7 [6-9]	7.5 [6-10]

Results | SWE and OV



* $p < 0.05$, Mann-Whitney U Test

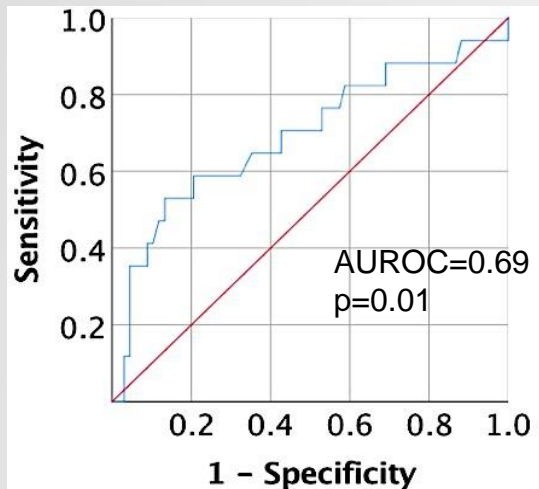
Not affected by:

- Time between SWE and endoscopy ($p=0.10$)
- Beta-blocker use ($p=0.52$)

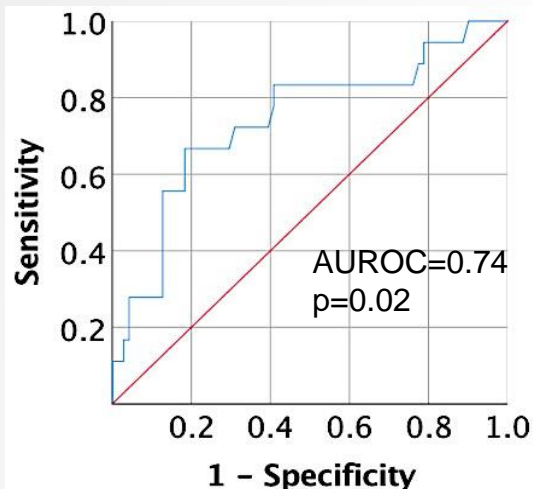
Results | Biochemistry and OV

Variable (N (%) or median (IQR))	OV absent n=71	OV present n=18	P
Median age (Years [IQR])	57 [51-67]	67 [57-71]	<0.05*
Median BMI [IQR]	28 [24-33]	30 [26-35]	0.37
Sex [% male]	66.2	44.4	0.11
Biochemistry (median [IQR])			
ALT (U/L)	34 [21-81]	63 [21-141]	0.85
AST (U/L)	43 [30-56]	59 [34-160]	0.17
Total bilirubin (micromol/L)	9 [7-25]	14 [10-36]	0.09
Albumin (g/L)	34 [32-40]	25 [21-31]	<0.05*
Prothrombin ratio	1 [1-1.2]	1.1 [1.1-1.2]	0.11
Platelet count (x10 ⁹ /L)	206 [128-264]	146 [73-191]	<0.05*
MELD Score	8 [6-9.5]	8 [6.8-11.5]	0.55

Results | SWE and OV



Platelet count

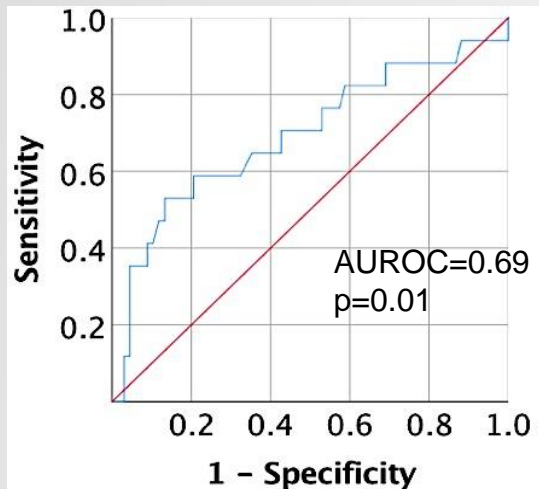


SWE

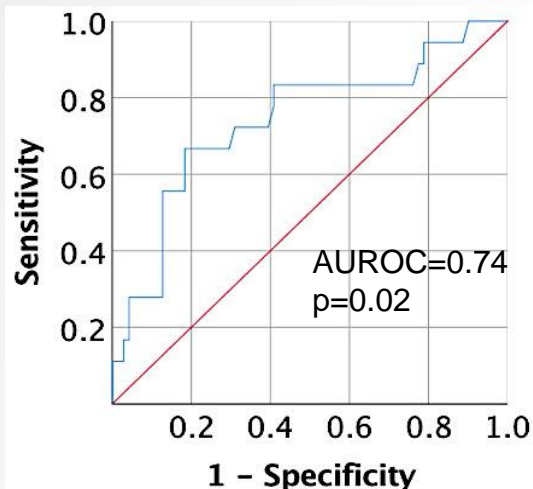
SWE alone ≤ 10.7 kPa

Sensitivity 89%, NPV 97%

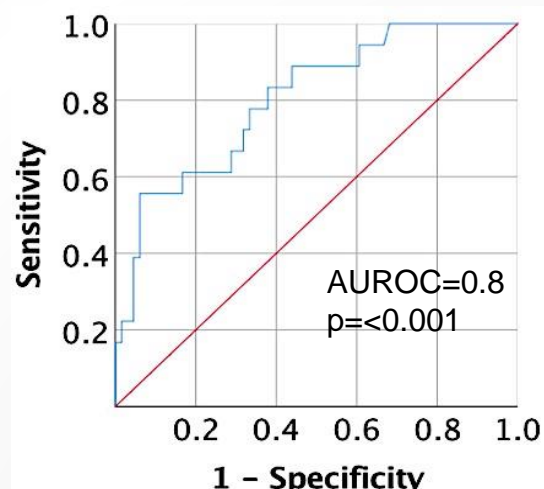
Results | SWE and OV



Platelet count



SWE



SWE + Albumin

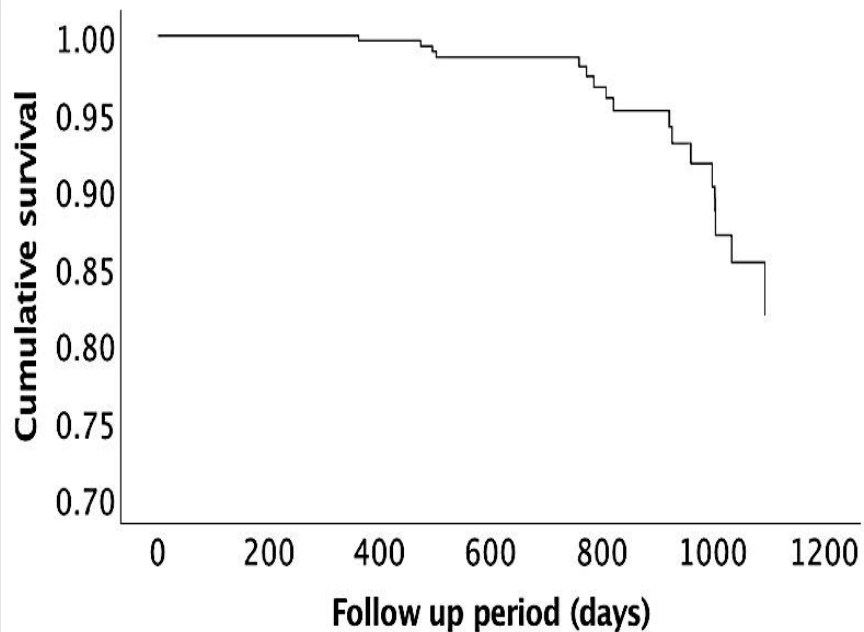
SWE alone ≤ 10.7 kPa
Sensitivity 89%, NPV 97%

**SWE score ≤ 12.4 kPa +
Albumin ≥ 37 g/L**
Sensitivity 88%, NPV 95%

Results | Morbidity n=304

Linear regression	n	Spearman's rho	p
All-cause admissions	137	0.2	0.007*
Liver disease related admissions	85	0.5	<0.001*
Infection related admissions	48	0.6	0.008*

Results | Mortality



Over a 3 year follow up:

- 19 deaths

Cox regression	Exp(B)	p
SWE Score (kPa)	1.02	0.04*
Age (years)	1.06	0.03*

Summary of results

- **Using 10.7kPa cut-off**
 - Excellent NPV for OV
- **Using 12.4kPa cut off + albumin >37g/L**
 - Improved accuracy
- **SWE is an independent predictor of morbidity and mortality**

Discussion

- **Comparison to literature on SWE**
 - Popescu et al. suggested cut off of 14.2 kPa, AUROC 0.58
 - Kang et al. suggested cut off of 14.1 kPa, AUROC 0.83
 - Cut offs may differ based on aetiology
- **Limitations**
 - Small sample size and retrospective design

Conclusion

- SWE score combined with albumin may be used to guide patient selection for endoscopic screening
- SWE scores are predictive of morbidity and mortality
- Larger prospective trials required to validate the predictive power of SWE

Acknowledgements

Dr Ashok Raj, Gastroenterologist, CMDHB

Ms. Lucy Mills, Gastroenterology CNS, CMDHB

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