Diagnostic Performances of Various Radiological Modalities in the Detection of Sarcopenia in an Asian population: A Systematic Review

Vanessa Malishree Dharmaratnam[1], Shawn Kok[2], Fung-Joon Foo[1], Winson Jianhong Tan[1], Jia-Lin Ng[1], Sharmini Su Sivarajah[1], Leonard ML Ho[1], Cheryl Xi-Zi Chong[1], Darius Kang-Li Aw[1], Jasmine G Ladlad[1], Cheryl Hui-Min Tan[1], Esther Chan[2], Nicky Wong[3], Dominic Yap[3], Lincoln Chew[3], Sherryl Ng[3], Cherie Tong[4], Hui-Bing Tan[4], Jason MW Chua[5], Shipin Zhang[6], Frederick Hong-Xiang Koh[1]

Affliations: [1]Department of General Surgery, Sengkang General Hospital, [2]Department of Radiology, Sengkang General Hospital, [3]Yong Loo Lin School of Medicine, Singapore, [4]Department of Dietitics, Sengkang General Hospital, [5]Institute of Molecular and Cell Biology, A STAR, [6]National Cancer Centre, Singapore

Introduction

- Sarcopenia is associated with frailty, higher hospitalisation rates and increased mortality in older adults
- However, there is no consensus on an imaging modality of choice for the diagnosis of sarcopenia in Asians

Aims

- Determine the most validated imaging modality for the detection of sarcopenia in Asians

Methods

- A systematic review was conducted on MEDLINE, EMBASE and Cochrane Library databases up to April 2022 with no start date
- MeSH terms used – "sarcopenia"; "diagnosis"; "assessment"

Inclusion criteria	Exclusion criteria
• Follows AWGS definition of sarcopenia • Retrospective cohort study, Randomised controlled trials • Asian study population • Evaluates accuracy of imaging modality in assessing muscle quantity/quality • Human subjects • Written in English	• Follows EWGSOP definition of sarcopenia • Letter-to-editor, Case reports, Editorials, Comments • Non-Asian study population • Does not evaluate accuracy of imaging modality in assessing muscle quantity/quality • Animal subjects, in-vitro • Not written in English

Table 1: Inclusion and exclusion criteria for study selection

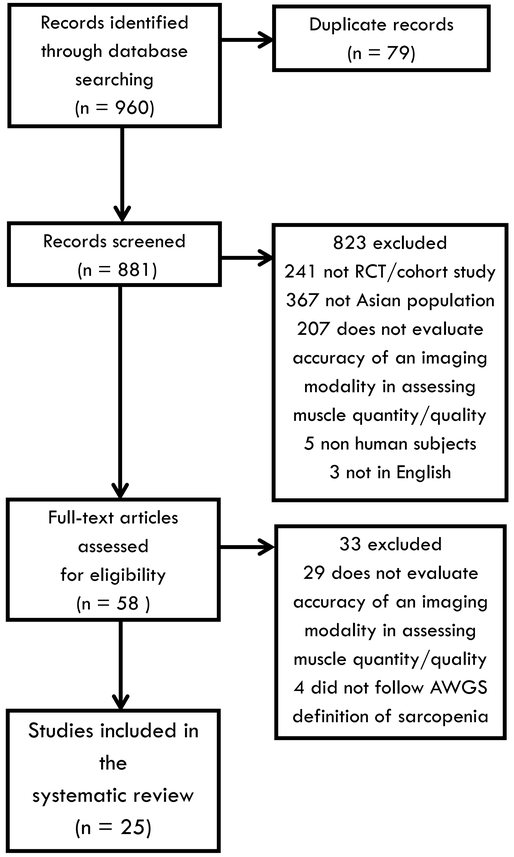


Fig. 1: PRISMA diagram for systematic review

Results

Modality	No. of Studies	No. of Subjects	Mean Sample Size	Mean Sample Age
Ultrasound	6	836	146	72
CT	12	18329	1527	59
MRI	2	252	126	70
DXA/BIA	5	1354	339	62

Table 2: Baseline Characteristics of Selected Studies

Modality	Mean AUC	Sensitivity	Specificity
Ultrasound	0.74	82.84	76.54
CT	0.81	-	-
MRI	-	-	-
DXA/BIA	-	68.8	86.9

Table 3: Mean AUC, Sensitivity and Specificity by Modality

Modality	Muscle Parameter
Ultrasound	Muscle thickness Muscle CSA Echo intensity
CT	Skeletal Muscle Index Muscle CSA, CTV
MRI	Muscle CSA
DXA/BIA	ALM / ASMI

Table 4: Common Muscle Parameters used for each Imaging Modality

Muscle site	Mean AUC
Single	0.74
Rectus femoris	0.71
Tibialis anterior	0.86
Gastrocnemius	0.65
Combined	0.73

Table 5: Mean AUC by Muscle Site on Ultrasound

Overview of Radiological Modalities

Modality	Benefits	Limitations
Ultrasound	• Cheap • No radiation • Quick to perform	• Operator-dependent • No validated cut-off values • Limited use in obese patients
CT	• Objective • Routine in clinical setting	• Costly • Ionising radiation exposure
MRI	• Objective • No ionising radiation	• Costly • Long duration of scan
DXA	• Validated cut-off values	• Not widely available
BIA	• Widely available	• Affected by metallic implants, obesity

Table 6: Weighing the benefits and limitations of various imaging modalities

Conclusions

- Ultrasound is valuable diagnostic tool that is validated for the detection of sarcopenia in Asians
- There is no large scale Asian comparative study comparing the various radiological modalities for the same patient