Appendix 1 Supplementary methods

Grid partitioning algorithm

To analyze the correlation between regions on the images more precisely, a grid partitioning algorithm was employed in this study.

At first, the reference image is established based on the mean image $\overline{X}$ of all frames in a sequence. Then, a rectangular grid is used to divide reference image into multiple square blocks, called reference blocks, $T=\{T_{0,0},\cdots,T_{j,k},\cdots,T_{G,G}\},0\le j,k<G$ with the size $T_{j,k}\in R^{w\times h}$ as shown in Figure S1A. Similarly, each input frame X_i was divided into multiple square blocks, called frame blocks, $E^i=\{E^i_{0,0},\cdots,E^i_{j,k},\cdots,E^i_{G,G}\},0\le j,k<G$ with the size $E^i_{j,k}\in R^{W\times H},W>w,H>h$ as shown in Figure S1B. Compared to the size of the reference block, the size of the frame block is enlarged to account for more respiratory motion induced change of image content. In this study, the grid size G is 4.

As shown in Figure S1, the frame block $E^i_{m,n}$ in frame X_i corresponds to the reference block $T_{j,k}$ in reference image $\overline{X}$. The template matching algorithm traverses the reference block to calculate the relative offset $v^i_{j,k}$ between the reference block and the overlapping frame block. As a result, each frame X_i can obtain a matrix $v^i=\{v^i_{0,0},\cdots,v^i_{j,k},\cdots,v^i_{G,G}\}$ which represents the relative shifts of blocks of each frame to their counterparts of reference image. This matrix serves as a feature vector to represent the local respiratory motion of each frame and used by the subsequent clustering algorithm.

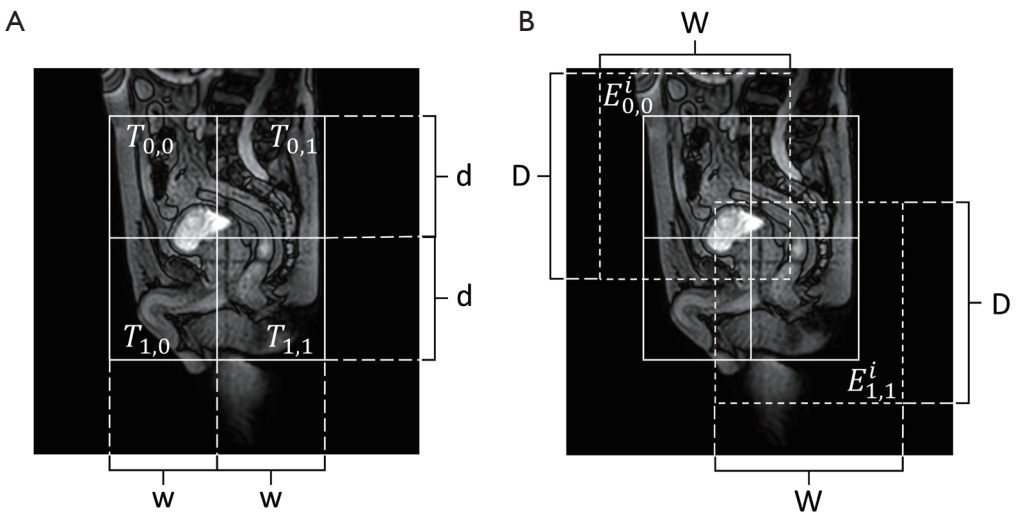

Figure S1 The illustration of square blocks in reference and frame images. (A) Reference blocks. (B) Frame blocks.

https://dx.doi.org/10.21037/qims-23-690