Fig 2: Panorama image of an esophagus with marked details (center), corresponding original frames with mapping of the marked structures (left and right)

Specifically, lesions depicted on this »eso-phagram« can then interactively be marked or tagged, hence showing their appearance in the original and unmodified video data in a new window as a cross-reference, s. Fig.2. This feature allows a smooth transition between the »esophagram« or »video map« and the original video image, since the rows in the »esophagram« are digitally linked to their contributing set of pixels and reference frames in the endoscopic video. Finally, based on the »video map« or »esophagram« a 3D-reconstruction of the tubular esophagus wall can be approxi-mated, s. Fig. 3. This 3D-reconstruction, which depicts the texture of the examined esophagus can then interactively be moved

and examined, hence yielding complete new interactive viewing and assessment possibilities of the upper GI tract.

Benefits

The »TubeStitcher« software converts esophageal endoscopic video data into an intuitively assessable »esophagram« for enhanced digital documentation in gast-roscopy. These »esophagram« can provide the missing context information and can be used to examine the complete esophagus at a glance. Using digital linking mechanisms, regions of interest in the »esophagram« can be interactively tagged and provide the same regions in the original endoscopic video.

Thus the »TubeStitcher« provides
– enhanced documentation of the esophagus,
– improved context-aware diagnosis,
– Interactive assessment of depicted lesions in a multi-view approach, and
– new educational possibilities.

Furthermore, the 3-dimensional reconst-ruction offers a condensed representation of the esophagus geometry, potentially highlighting deformations or perforations.

Also, the »TubeStitcher« can conceptually be applied to video-sequences of other tubular structures such as the urethra, or the trachea.

Fig 3: 3D reconstruction of an esophagus.