Body of evidence supports new anatomical finding

When Andreas Vesalius published his massive anatomical work *De Humani Corporis Fabrica* in 1543, he hoped to prove not only that anatomy was the foundation for all medical research, he also sought to challenge the anatomical standards of the time. Although met with great resistance, Vesalius' views prevailed, thanks largely to the help of artists from Titian's studio, who produced the stunning anatomical images that still grace the pages of medical textbooks. Now, almost five hundred years later, anatomical standards are again being challenged, though perhaps on a less grand scale, and the challenge is again being upheld through visual media. But the elaborate sketches and woodcuts of Titian's students have given way to three-dimensional (3D) rendering and CD-ROMs, which may not only change the way anatomy is taught, but also challenge basic assumptions that it is a "dead" discipline.

Are Vesalius' woodcuts giving way to computer rendering? The *sphenomandibularis* revealed.

Earlier this year, Gary D. Hack, an assistant professor of dentistry at the University of Maryland at Baltimore, and Gwendolyn F. Dunn, an orthodontist, announced that they had discovered a previously undescribed muscle in the course of their research on mastication muscles, or the muscles that affect chewing. This new muscle, which runs from behind the eye socket to the lower jaw, was revealed only by the unorthodox dissection methods they used (from the front rather than the side of the head, the usual approach described in anatomy textbooks). "There it was, just staring at us," says Hack. The researchers waited almost a year before announcing their finding, to make sure that the muscle had never been described anywhere else. It hadn't, although parts of it were pictured in some textbooks, generally labeled as one of the other mastication muscles. Hack, Dunn and their collaborators propose calling the new muscle the *sphenomandibularis*, reflecting its origin at the sphenoid and its insertion onto the mandible.

Although there have been small anatomical discoveries in the past couple of centuries (a capillary here, a bit of connective tissue there, and so forth), the discovery of a new muscle, especially in so obvious a place, is dramatic. Thus it is no surprise that the announcement was met with polite skepticism at best: stories appearing in major newspapers about the muscle featured anatomists saying it is "highly doubtful" or "hard to believe." However, a few anatomists have now found the muscle in cadavers by using Hack's and Dunn's dissection approach, and several medical imaging specialists also report seeing the "new" muscle in living patients.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

But perhaps the most dramatic — and elegant — support comes as a result of the US National Library of Medicine's (NLM) Visible Human Project (*Nature Medicine* **2**, 9; 1996). Engineering Animation, Inc., of Ames, Iowa, a company that specializes in 3D computer visualization, licensed the cross-sectional images of the human cadaver from NLM, and transformed them into an interactive 3D atlas of human anatomy they call *The Dissectible Human*. Anyone with a moderately powerful personal computer can take Engineering Animation's CD-ROM images and perform cadaver dissections on a desktop, with minimal cleanup and minimal caution (if you cut too deep, just back up a few frames and go at it again). By "dissecting" the digitized head from the same direction as Hack and Dunn used on a real cadaver, Engineering Animation scientists demonstrated the sphenomandibularis' existence as a distinct muscle from all previously described muscles of mastication (see figure). Not only does this back up Hack and Dunn, but it suggests that *The Dissectible Human* could become a powerful supplement, if not a substitute, for traditional cadaver dissections, and a way to make future anatomical discoveries.

Despite the support from Engineering Animation programmers, anatomical confirmation itself is not enough to force the sphenomandibularis into the pages of the *Nomina Anatomica*, the dictionary of internationally recognized anatomical structures. "We need to prove that the muscle is biochemically and physiologically distinct from any of the other muscles of mastication," says Hack. To that end, the dentists have been collaborating with Peter J. Reiser of the Ohio State University College of Dentistry. Reiser, who heard a news story on his car radio about the new muscle and called Hack the next day to ask for samples to test.y, says he told Hack that "if what he thought was true of this muscle, then we could show it biochemically." Reiser is analyzing the relative amounts of "fast" and "slow" myosin in the different mastication muscles, as well as physiologically testing individual muscle fibers for "fast" and "slow" contraction. According to Reiser, "preliminary results" indicate that the muscle identified by Hack and Dunn is biochemically distinct from the other chewing muscles. Plans to perform physiological tests await the availability of suitable donor tissue.

The mounting evidence has earned Hack an invitation to defend his and Dunn's work in a talk at the next meeting of the American Association of Anatomists, the guardians of *Nomina Anatomica*. "This is all so unbelievable," says Hack — a sentiment still echoed by many anatomists. But the excitement generated by a new discovery in a field considered moribund, together with the powerful tool of computer 3D-rendering, could recruit a whole new flock of would-be Vesaliuses discovering all kinds of things we didn't know existed right under — or behind — our noses.

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