

## CHAPTER 3

# Finishing and Refining

### CD Files

BendingTest.ma  
Kila\_Basic.mb  
Kila\_Details.mb  
Kila\_Face.mb  
Kila\_WithFeet.mb  
Kila\_Finger.mb  
Kila\_Foot.mb  
Kila\_Hand.mb  
Kila\_WithHands.mb  
Kila\_Muscles.mb  
MuscleLines.jpg  
UpperMuscles.jpg  
FaceMuscles.jpg  
*In Scans directory:*  
Hand\_Top.jpg  
KilaFaceFront.jpg  
KilaFaceSide.jpg  
KilaFront.jpg  
KilaSide.jpg

**YOU HAVE SPENT** valuable time developing your basic model and getting the size, shape, and proportions correct. Although it may look good and clean at this point, many areas still need work in order for this to be a successful game model. This chapter will help you take the base mesh you have created and build upon it by adding details to the geometry. In addition, you will make it deform convincingly by implementing real-life muscle structures into the topology.

## Know Your Anatomy

Studying anatomy will help you be more aware of character form and movement. You'll become better at drafting and animation, and you'll build more efficient models.

Before you embark on this chapter, it's important to gather a few good anatomical references, be they books or Web sites. There are hundreds of online resources you can use. Each of these sites offers literally hundreds of images available to download. See Appendix B, "Reference and Further Reading," for a list of suggested books and Web sites.

Of course, the best and most convenient reference is *you*. Get yourself a mirror and study your own body.

## Muscle Line Mapping

Let's start working. Load the last file you saved in Chapter 2, called Kila\_Basic.mb.

Look at your character model (**Figure 3.1**). So far, it's quite well defined and the proportions are correct. It is a good base model. In fact, with a bit of optimization, you could use her as a low-resolution character just as she is. She would not, however, be good as our main model. We still have a few problems to address:

- ▶ Taken statically, she looks fine, but once you start to animate her, the flaws will show. There will be breaks or bulges in the areas that bend, either because they don't have enough polygons or because the topology needs some work.

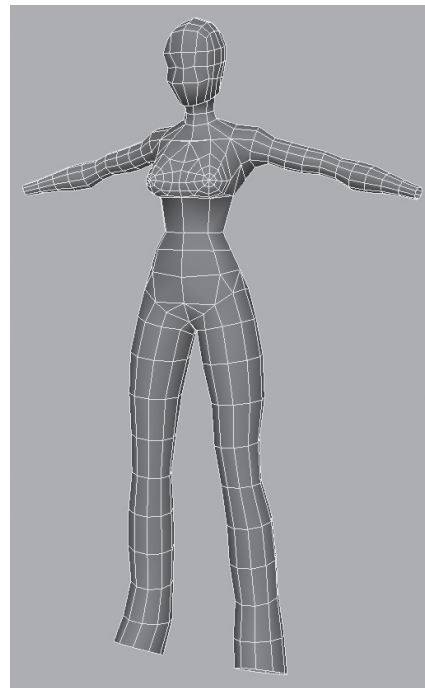


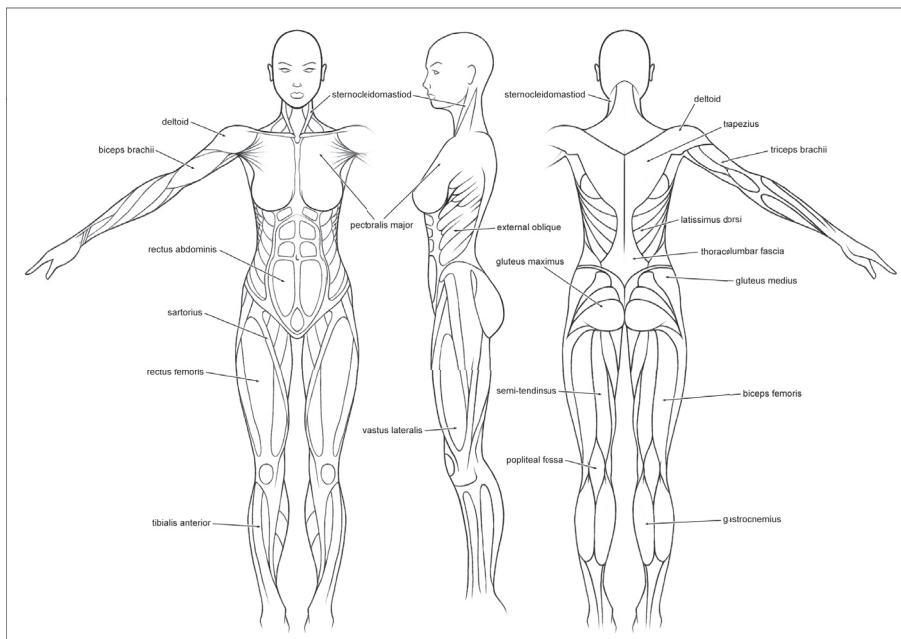
FIGURE 3.1 Our base model

- ▶ The mesh as it stands has too many polygons that simply are not needed.
- ▶ She lacks physical detail in both her body and face.
- ▶ This model still has no hands or feet.

Our first step is to physically map the muscle groups onto the mesh. Doing this gives us a good understanding of how the mesh will move. In turn, when we animate the model, the polygons will deform, giving the illusion of muscles deforming under the skin. While we are adding these lines to the mesh, we can also add detail, giving additional shape to the geometry while we check its deformability.

**TIP** A lot of detail can be gained through the texture map (more on this in Chapter 9, “Texture Painting”). Try not to get too caught up in building small details into the geometry—you’ll just use up processor power, meaning fewer polygons can be used elsewhere in the game.

Use **Figure 3.2** to guide you in placing the muscle lines on the mesh. This illustration shows a simplified version of the muscles. All we need is a basic idea to work with; at this point, we’re just implementing the main muscles.



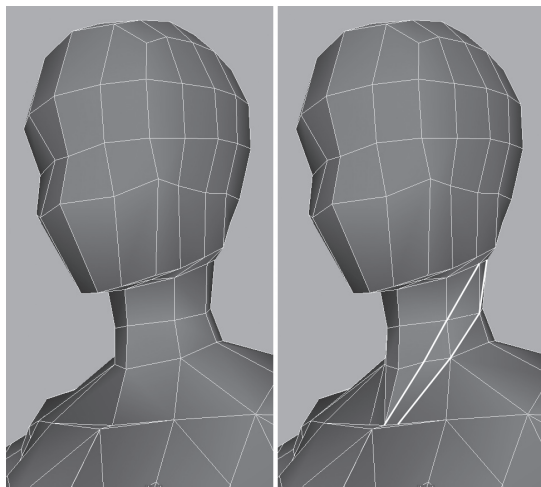
**FIGURE 3.2** Basic muscle lines of the human body

We will start at the top and work our way down, but we will skip the head for now and concentrate on that area later in the chapter. So select the left side of the mesh, and let's get started.

### The Neck

Refer to the neck in **Figure 3.2**. You can see two large muscles coming from the ears and ending where the collarbones meet in the center of the chest. These are the sternocleidomastoid muscles. Let's add these to our model.

- 1 We are going to split the polygons around the neck, carving these muscles into the mesh. Start by going to Edit Polygons > Split Polygon Tool.
- 2 As you did in the preceding chapter, click and hold on the starting edge around where the ear should be. A small icon appears, representing the starting point of the cut. Move the point up until you are at the corner where two edges meet, and release the button.
- 3 Select the point on the next edge where you wish to cut, and press Enter to finish that cut.
- 4 You need to work your way around until you get to the collarbone, as shown in **Figure 3.3**. You will have to do it a polygon at a time, selecting each edge that you encounter on the way.



**FIGURE 3.3** Adding the sternocleidomastoid muscles

**NOTE** You don't have to always end up in the corner of two edges; you can cut anywhere along an edge. However, it's wise to begin where a vertex already exists and try to end on one, too.

**TIP** As you are cutting, you will find that occasionally you can't go any farther with the current cut. This could be caused by an unshared edge, or faces that are flipped the wrong way. It isn't a problem—just press G to finalize the current cut; this will also restart the Split Polygon tool. Then start a new cut from where the previous one ended.

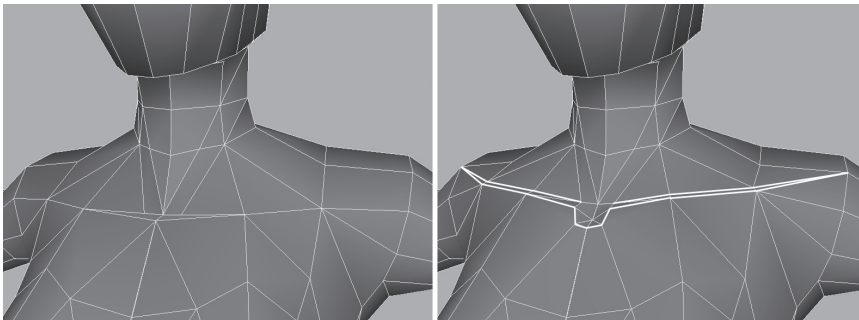
If you are using a mirrored instance, you will notice that the cuts you make on one side will be mirrored across to the other. Also, when you create a cut, it automatically turns the new edge into a crease, making the normals hard. It's probably a good idea to smooth them as you go along. To do this, select the edges you wish to smooth. Then go to Edit Polygons > Normals > Soften/Harden and set the options to All Soft. Click the Apply button and close the options.

I think that's about all for the neck. As mentioned earlier, we only need a basic layout of the muscles. Adding too much detail now would be pointless because most of it will be removed later, when we optimize the geometry.

### Collarbones

Moving down, we come to the upper body, so let's implement the collarbones next (**Figure 3.4**, left).

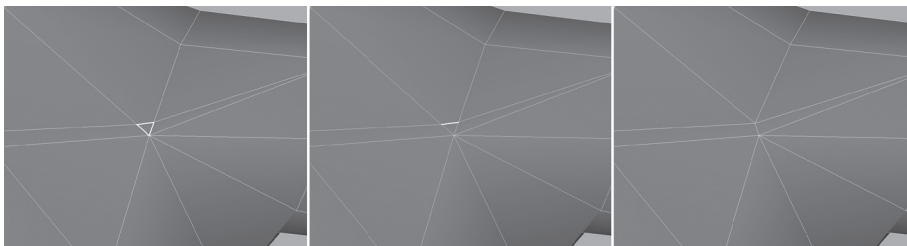
Use the Split Polygon tool to carve out the details, as shown in **Figure 3.4** on the right. Don't be afraid to move some of the vertices to further sculpt the area until it resembles its anatomical reference.



**FIGURE 3.4** Adding the collarbones to the mesh

If at any point you end up with tiny triangles starting to appear, as in **Figure 3.5** (left), feel free to remove them. You can do this in one of two ways:

- ▶ Right-click the mesh and select Vertex from the marking menu, moving you into vertex editing mode. Select the two vertices on either side of the edge you want to remove, and weld them.
- ▶ Right-click the mesh and select Edge from the marking menu, moving you into edge editing mode. Select the edge you want to remove (the middle view in **Figure 3.5**), and then go to Edit Polygons > Collapse. This removes the edge, bringing in the vertices on either side and welding them (**Figure 3.5**, right).



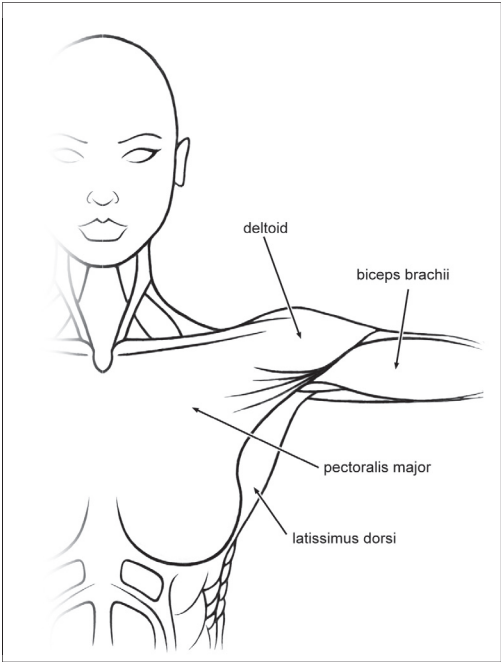
**FIGURE 3.5** Remove any tiny triangles by using the Collapse tool.

### The Chest and Shoulders

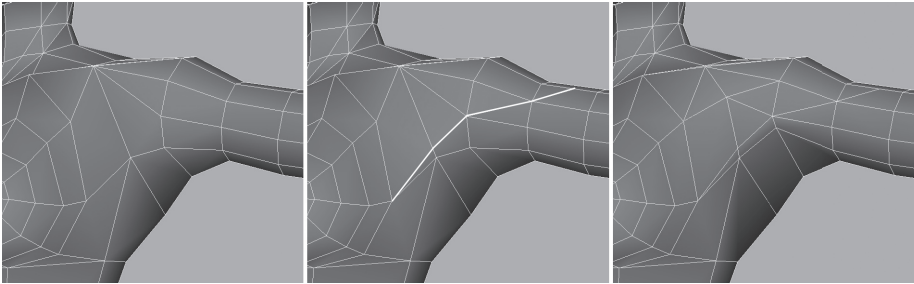
Moving on, we can start working on the chest and shoulder area. Refer to the muscle reference in **Figure 3.6**, which focuses on the shoulder area. You can see that the huge muscle on the chest, the pectoralis major, stretches across and under the shoulder muscle, the deltoid. It would probably make sense to try and sculpt these at the same time, and then work on the armpit area before progressing to the rear of the upper body section.

Using the Split Polygon tool, create a new line following the outline of the two muscles lying across the chest and over the arm (**Figure 3.7**, middle).

**TIP** ▶ When you're done with an area, feel free to work on it further, adding more edges and manipulating the vertices until you are happy with the shape.



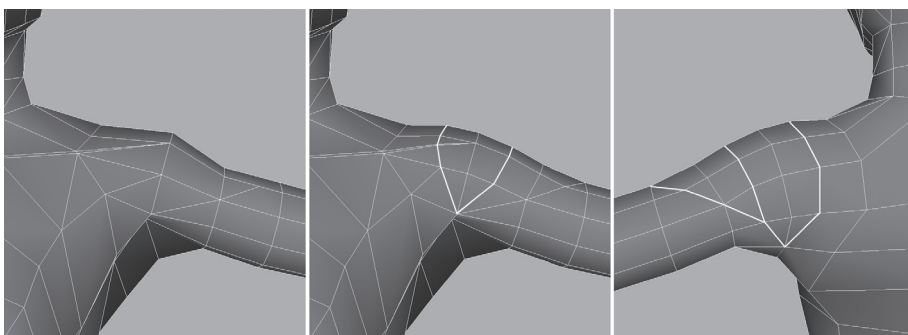
**FIGURE 3.6** Upper body muscle lines, with the arm raised



**FIGURE 3.7** Add detail to the chest, shoulder, and armpit areas.

Looking at **Figure 3.8** (left), the shoulder seems a little angular; this is because there are too few polygons here at the moment. When this area bends in animation, we will get quite a rough-looking deformation. You can prevent this by adding extra strips across the top as you continue adding the muscle lines.

Split the polygons as I have in **Figure 3.8** (middle), following them around to the back of the shoulder (**Figure 3.8**, right) while continuing the line for the deltoid muscle.



**FIGURE 3.8** Insert more polygons into the shoulder.

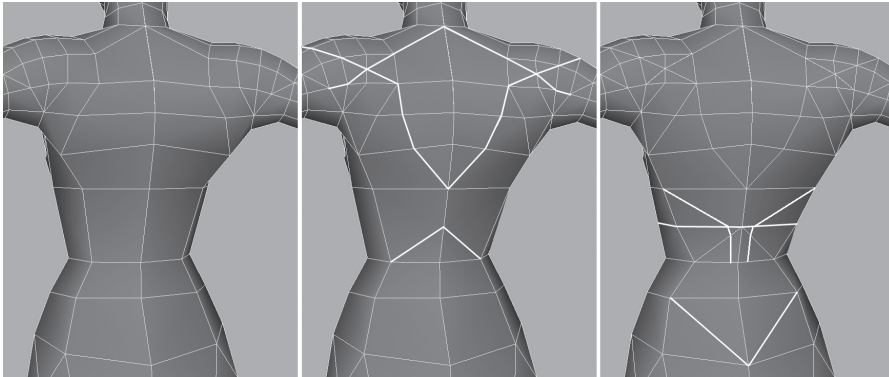
Move the newly created shoulder vertices out slightly to round off the area.

### The Back

This brings us nicely around to the rear of the upper body. We don't need immense detail here, either, but it's important to get the basic muscles in.

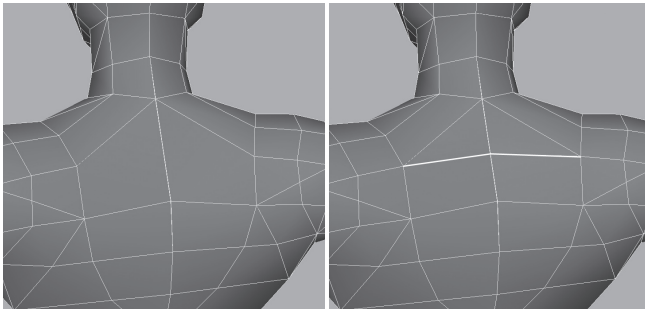
Starting at the top of the back and moving downward, work in the trapezius, lattimus dorsi, and thoracolumbar fascia muscles (refer again to the anatomical reference as you go). See the left and middle views of **Figure 3.9**.

Halfway down the back, just above the hips, there is quite a large space. It will make life easier if we subdivide this area, allowing us to continue adding the back muscles (**Figure 3.9**, right). Follow the cut all the way around to the front of the mesh.



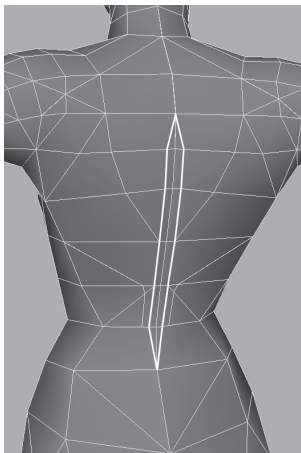
**FIGURE 3.9** Add muscle lines to Kila's back.

Still on her back, we could implement the spine at this point. This will be a simple recess down the center of her back. First, though, as you can see in **Figure 3.10** (left), there is another large area in between her shoulder blades. Take a moment to split this area, taking the cut across the center as in **Figure 3.10** (right).



**FIGURE 3.10**  
Subdivide the large polygon at the top of the back.

Now, to create the recess for the spine (**Figure 3.11**), split the polygons just on either side of the center, remembering to remove any small triangles that are created. Finally, move the vertices that run down the center slightly inward.

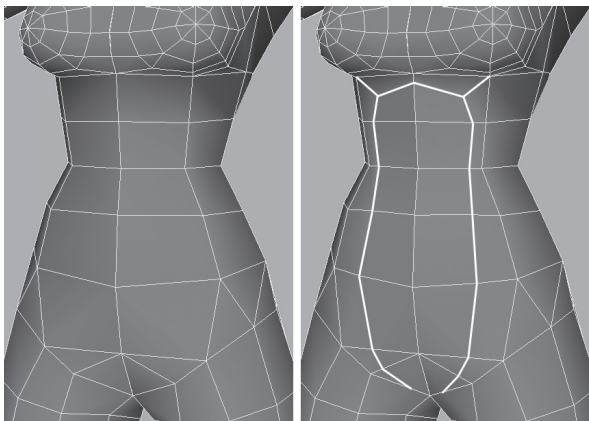


**FIGURE 3.11** Insert the recess for the spine.

Now is probably a good time to delete that history that has steadily been building up.

### The Stomach

Moving around to Kila's front in **Figure 3.12** (left), we can begin to work in her stomach muscles. Split polygons and move vertices to get the general shape seen in **Figure 3.12** (right).



**FIGURE 3.12** Add muscle detail to the stomach.